

The Legacy of Contamination and the Redevelopment
of Inner-City Industrial Districts

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Abstract

This study examines the role that land contamination plays in hindering central city redevelopment. We tracked all sales, the selling price, existence of contamination, location, and length of time on the market in one industrial area of approximately 5,580 acres in Southwest Baltimore. The results indicate that after the mid 1990s, contaminated parcels are selling and the market has adjusted to contamination by lowering sales prices. Over the decade 45 parcels with either confirmed or historical reasons to suspect contamination sold. Interviews with owners and brokers of the parcels on the market for two years or more indicate that outdated parcel sizes, inadequate roads for modern truck access, outdated and aging infrastructure, incompatible land uses, and high asking prices are the most significant barriers to the redevelopment of industrial central city districts

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Introduction and Research Questions

As “Smart Growth” and its promise of more livable cities catches the imagination of planners, academics, and developers, the redevelopment of inner city brownfield sites becomes an even higher priority. To justify limiting development on green field sites, regions must find buildable land within existing city limits. Contamination, the legacy of non-existent environmental laws¹ and our industrial past, is widely perceived to be a deterrent to central city revitalization, especially in the industrial Northeast.

Are the costs of cleanup so high relative to land values that government has to step in to provide subsidies? Has the refusal of banks to finance such transactions undermined market demand, or has the lack of information about the risks and costs led to market failures in the central city industrial land market? To what extent is contamination deterring central city revitalization, and to what degree are other factors impediments to central city redevelopment? This study attempts to answer these questions by tracking all sales, the selling price, length of time on the market and presence of contamination in one industrial area of Southwest Baltimore. This methodology allows us to document the degree to sales were restricted to the area’s clean parcels and to identify factors, other than contamination, that are to blame for what is perceived as a relatively sluggish central city industrial land market. The results indicate that after the mid 1990s, contaminated parcels are selling and the market has adjusted to contamination by lowering sales prices. In fact, contamination does not appear to be a major barrier, when the intended land use is also industrial. To seriously implement “Smart Growth” and central city revitalization, advocates will have to tackle the often ignored problems of older industrial areas, such as outdated parcel sizes, inadequate roads for modern truck access, outdated and aging infrastructure, incompatible land uses, and unrealistic assumptions about the land’s possibilities.

Literature Review

Brownfields are viewed as a significant barrier to the redevelopment of urban industrial parcels. There are two reasons the literature has come to this conclusion. One is by definition. The EPA definition of a brownfield is an “abandoned, idled, or under-used industrial and commercial facilit[y] where expansion or redevelopment is complicated by real or perceived environmental contamination” (U.S. Environment Protection Agency 1997). Therefore by definition, contamination is the barrier to redevelopment. This definition excludes all the other contaminated sites on which development occurred - thereby perhaps exaggerating the overall role that contamination plays in discouraging development. Secondly, both the literature and public policy may overstate contamination as a redevelopment barrier because the data have not been available to indicate otherwise. Case studies comprise the most common methodology in the brownfield literature. Most cases highlight best practices (ICMA 1998, Wernstedt and Hersh 1998) or the barriers to redevelopment. The barriers literature focuses on the role of cleanup costs, fears over future liability, the difficulty of obtaining private financing (Bartsch 1996, Swartz 1994, Yount and Meyer 1994, Staley 1996, Yount 1997, De Sousa 2000 and De Sousa 2001, and U.S Environmental Protection Agency 2002) and the legal and litigation costs associated with any purchase agreements and collection of damages from other legally liable parties (Duff 1994). Most often these cases focus on sites that have reached public attention because of a lack of private sector interest, giving the impression that contamination is the major barrier to central city industrial redevelopment.

In spite of a long literature that focuses on the costs, risks, liability, and barriers to

redeveloping a contaminated site (Bartsch and Collaton 1996, Schriener 1998, Bartsch 1996, Green Leigh 1994, Greenberg, Lowrie, Solitare, and Duncan 2000, Page and Rabinowitz 1994, Page and Rabinowitz 1993, and U.S. Environmental Protection Agency 2002), several decades of successful cleanups and redevelopment projects reflect the existence of conditions where some developers find it profitable in some locations to absorb the risks of purchasing, cleaning, and reusing contaminated parcels (Pepper 1997). Meyer and Lyons (2000) document the emergence of entrepreneurial firms that are redeveloping brownfield sites without public sector intervention. They found these private ventures favor sites in high value locations, under private ownership, and larger parcels. These case studies do not estimate the price discounts associated with contamination, nor do they put contamination in perspective with the other conditions that may cause redevelopment to fail.

Three studies examine the price discounts associated with contamination (McGrath 1995; Page and Rabinowitz 1993 and Howland 2000). McGrath found redevelopment is occurring on polluted sites and with “discounts in land value due to contamination risk [that]... are consistent with the limited cost data available....The industrial land market is highly competitive in the City of Chicago...and it appears that the market has successfully valued and capitalized the contamination liability” (P. 18). Tracking sales over a 2 ½ year period at the Port of Baltimore, Howland (2000) found price discounts on contaminated parcels and that contaminated parcels, when discounted, were as likely to sell as “clean” parcels.² Page and Rabinowitz (1993) found land price reductions of 10 to 50 percent on four industrial projects spanning three states. The Howland (2000) study identified all parcels in one industrial over a 2 ½ time period as in use or idle, on the market, and sold or for sale. She found that less than 5% percent of the land was idle and not on the market, and an even smaller proportion of could have been off the market because

of contamination.

Greenberg, Lowrie, Solitare, and Duncan (2000) studied brownfields in New Jersey and in a survey of municipal tax assessors, identified barriers to redevelopment aside from land contamination. These barriers included state and local regulations (aside from those related to brownfields), unsafe neighborhood conditions (i.e. crime, stray animals), industrial decline, more attractive adjacent areas, lack of schools, and poor transportation access.

The contribution of the current study comes from its focus on all sales in one industrial area over a ten year period. These sold and for sale parcels include contaminated and clean sites. Much of the previous literature looks at the barriers to redeveloping brownfield sites - looking at only contaminated sites spread across cities and regions. By identifying all parcels in one district and tracking their sale and selling prices over a decade, we can determine the extent to which parcels that sold over the decade were clean versus contaminated, the price discounts associated with contaminated parcels that sold, and the characteristics of parcels that are not selling.

Overview of Area and Early History

Water power from the Jones Falls, proximity to a port, the presence of rail lines, and proximity to the downtown were the original industrial attractions to Camden Carroll.³ Using Sanborn Maps, heavy industry can be traced there back to the 1890s. The Sanborn maps indicate the presence of glassworks, metal foundries and ironworks, brick works, engine shops, meat slaughter and packing, steel and iron foundries, lumber yards, paint and varnish manufacturers, household products manufacturers, and scrap metal yards. The study area includes approximately 5,580 acres and 740 industrial parcels.

Sources of Data

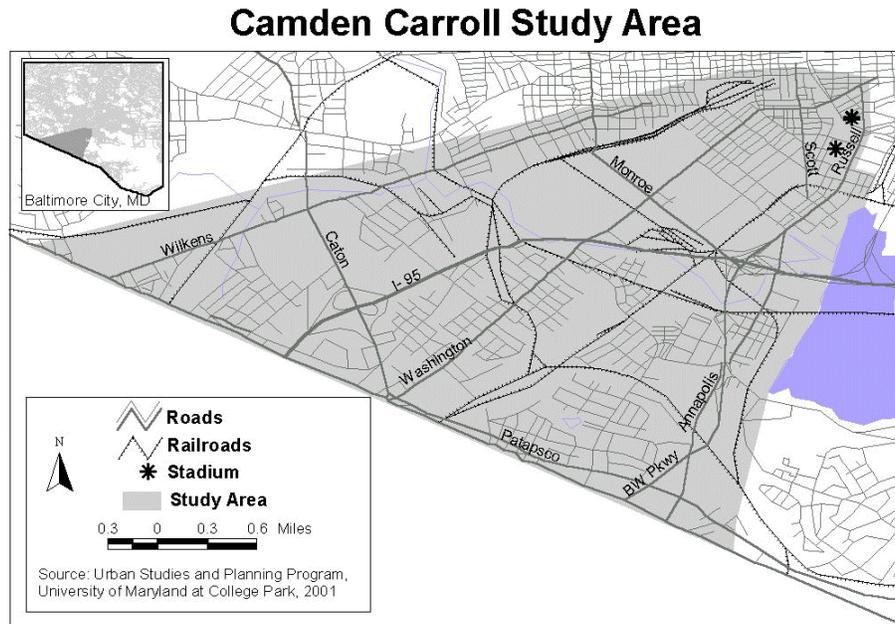
Identifying Sales Transactions

The geographic area expands the City's enterprise zone to include the industrial district known as Carroll Camden. The base map was created from the Baltimore City Department of Public Works (DPW) parcel point file. This GIS coverage records parcels by address and block lots and includes information on the current owner, zoning category, land use, last sale transaction back to 1988, and sales price. We include only industrially zoned and used parcels, specifically those that fell within the B3 and B4 categories and were industrial uses and all M class categories.

Real estate transactions data were obtained from five sources. First, we extracted sales and price data from 1990 to 2000 from the Baltimore DPW property tax records. These data were supplemented and cross checked with information from the Baltimore Development Corporation (BDC), the State Department of Assessment and Taxation data (SDAT), COSTAR - a privately maintained realtor data base, and the MacKenzie Group - a commercial real estate broker. The SDAT file lists sales back to 1996 and these data were compared with and used to supplement the 1990 to 2000 data from the Baltimore DPW property tax records. Whereas DPW and SDAT data sources contain information on properties that sold, COSTAR contains information on commercial parcels currently for sale through real estate brokers. COSTAR records contain contact information, asking prices, descriptive data regarding unique features of the sites, and previous sales information for sites currently on the market. BDC provided information on a few parcels for sale by owner. The MacKenzie Group added the time a parcel remained on the market prior to sale, and where missing, the MacKenzie data were supplemented with time on the market information obtained through personal interviews and phone calls to

sellers and brokers. Still, time on the market is missing for a large number of observations.

From these sources, a data set was created with all industrial parcels in the study area. This includes industrial parcels never on the market after 1990, those currently for sale, and those that sold between 1990 and January of 2000. We geocoded owner, address, sales price, date of sale, sales history, time on the market of last sale, acreage, unique features of the site, improved or unimproved, and accessibility to the highway. The final result is 740 identified industrial records within the boundaries shown in Figure 1. The final number of parcels that went on the market over the decade is 161. This includes sales through brokers and by owner.



Environmental Information

To capture environmental conditions on each of our industrial properties, we looked to three sources; the US Environmental Protection Agency (EPA), Sanborn Atlases, and the State of Maryland Department of the Environment. We collected substantial qualitative information

on environmental conditions on each site and developed a broad ranking system for the potential contamination level. The categories are 1) clean or no reasons to suspect contamination, 2) adjacent to a contaminated parcel, 3) potential historical contamination, and 4) confirmed contamination.

We looked for evidence of contamination on EPA's list of Superfund sites, the National Priorities List, and the Federal Brownfields Program, and with the State of Maryland, Department of the Environment (MDE). These data were filtered through a review and selection of records that fell within the zip codes overlapping our study area.⁴ The MDE records of all parcels where there were toxic spills and releases, neighborhood complaints of contamination, and sites processed through the Voluntary Cleanup Program. Freedom of Information requests were filed to the MDE for all for sale and sold properties. The typical contamination included asbestos, heavy metals, PCBs, cadmium, lead, polycyclic aromatic hydrocarbons, heavy oil contamination and leaking underground chemical and oil storage tanks. These sources indicated confirmed contamination on 21 parcels that sold over the decade in the study area. Although many of these sites have been subsequently remediated, we record here their condition at time of sale.

The Sanborn Fire Insurance Atlases were the primary source for identifying potential historical contamination. A review of Sanborn Atlas's for southwest Baltimore City was conducted for 1890, 1915, 1951 corrected Sanborn, and 1953. Sanborn Atlases provide information regarding original site boundaries, historical activities on each parcel, and the layout of activities within the site. We rely on the Sanborn maps as there is frequently a connection between the level and type of contamination and the kind of manufacturing activity. Parcels with an historical use of steel and aluminum milling, chemical production, paint and varnish

manufacturing, metal foundries and plating, glass works, coal bins, rubber cement milling, printing, engine shops, and fuel oil and crude storage uses prior to 1953 were classified as having reason to suspect contamination. Of the 144 sold sites, 23 had historical uses that would suggest contamination.

Results

Over the period, March 2, 1990 until November 2, 2000, 161 properties, for a total of 379 acres, went on the market, 144 properties sold, 18 of these were sold at least once during the decade and re-entered the market⁵, and at least one additional parcel was listed for sale and then pulled off the market when it didn't sell. Sixteen parcels were on the market as of November 2, 2000. Most market activity occurred in the last years of the decade.

The break down by level of contamination and year of sale are shown in Table 1.

	1990-1993	1994-1996	1997-2000	Total Number of Sales	Percent of All Sales
No evident contamination	5	13	54	72	50%
Adjacent to contaminated property	1	6	21	28	19%
Potential Historical Contamination	4	2	17	23	16%
Confirmed Contamination	1	2	18	21	15%
Total	11	23	110	144	100%

While the largest share of sales were clean sites, 15% of the sales were parcels had confirmed contamination at their time of sale. Two parcels went through the Maryland Voluntary Cleanup Program, which was initiated in 1997. One was cleaned before it sold and a second was cleaned and cleared through the program after sale.

Table 3 reports the regression results predicting the sales price per acre of all sold parcels. The dependent variable is the real sales price per acre in 1982 dollars. The independent variables are:

Adjacency; a dummy variable if the parcel is adjacent to one that has historical contamination or known to be contaminated.

Historical; a dummy variable if the parcel has a prior use likely to have generated contamination; Contaminated; a dummy variable if the parcel is known to be contaminated at the time of sale;

One; a dummy variable if the parcel is one turn off the main highway.

Two; a dummy variable if the parcel is two turns off of the main highway.

Three; a dummy variable if the parcel is three turns off the main highway.

AREA; the size of the parcel in acres.

Yr_sold; The year the parcel sold.

Imp; a dummy variable indicating whether the parcel includes improvements, primarily buildings.

Table 2: O.L.S. Results for all Sold Parcels - Dependent Variable is the Real Price Per Acre

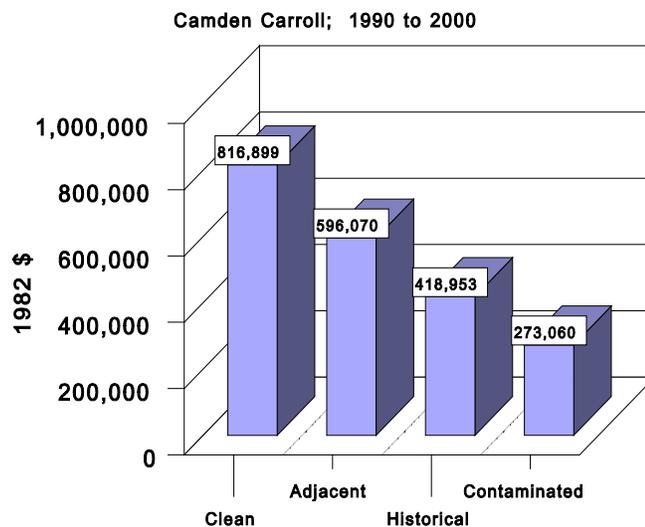
	Model I	Model II
Intercept	-170,733,190* 77,848,482 [-2.19]	-171,472,458* 79,524,768 [-2.16]
Adjacent	-353,978 249,609 [-1.42]	-359,656 253,373 [-1.42]
Historical	-543,848* 264,550 [-2.06]	-539,268* 269,537 [-2.00]
Contaminated	-559,762** 309,517 [-1.81]	-594,959** 324,613 [-1.83]
One Turn	-530,875* 216,667 [-2.45]	-531,044* 219,329 [-2.42]
Two Turns	135,904 293,248 [.46]	150,785 303,346 [.50]
Three Turns	-776,536** 443,710 [-1.75]	-864,007** 484,558 [-1.75]
Area	-35,286 22,521 [-1.57]	-33,621 23,728 [-1.42]
Yr_sold	86,059* 38,968 [2.21]	86,436* 39,790 [2.17]
Improvements	- - -	-14,699 301,099 [-.05]
N= R2= Adj R2= * Statistically significant at the .05 level ** Statistically Significant at the 10 level	133 .16 .11	131 .17 .10

After holding transportation access, size of parcel, and the year sold constant, the presence of contamination reduces the sales price. The coefficients on historical and contaminated are significant at the 5% and 10% levels respectively. A clean site on the main road sold for an average of \$836,119 per acre. A parcel adjacent to a site with known or historical reasons to

suspect contamination was discounted 42%. A site with historical activities that suggest contamination might be an issue was discounted an average of 65% and a site with known contaminated was discounted an average of 67%. These discounts probably reflect (1) the fact that there is a more limited market for contaminated properties because the purchasers are limited to those with their own non-bank sources of credit, (2) delays associated with testing and assessing the costs of remediation, (3) costs and delays associated with cleanup before the property can be put to productive use, and (4) any additional risk associated with owning a polluted parcel.

As expected parcels off the main highway sold at a discount. One turn off the main highway reduced the sales price by an average of \$530,000. Two turns off the main highway is not statistically significant, yet three turns off the highway reduced the sales price by an average of \$776,536.

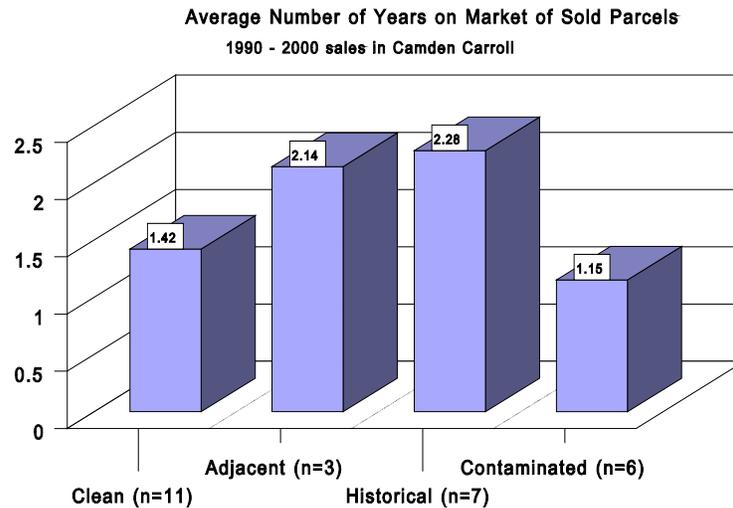
Average Sale Price/Acre of Sold Industrial Parcels



The year that the property sold, Yr_sold, is positively associated with the sales price. More recent sales recouped higher prices. Neither the presence of improvements nor the square footage of enclosed space⁶ are statistically significant. This isn't surprising since improvements may

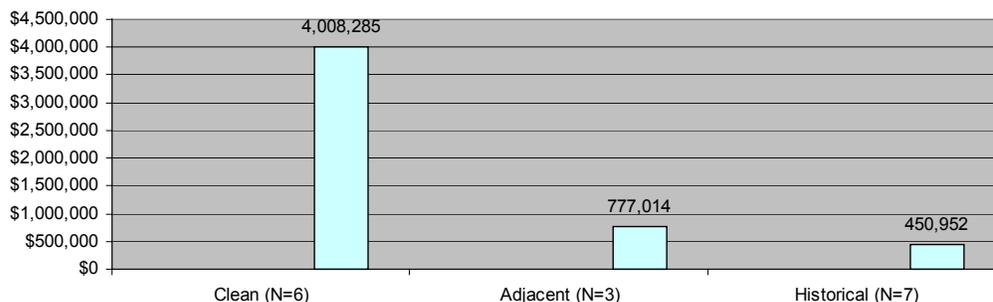
represent a usable building or a costly demolition.

Properties adjacent to known contaminated parcels and parcels with prior uses that would suggest contamination spent more time on the market than the properties known to be contaminated (see Figure 3). This may be because Phase I and Phase II testing had already been done on parcels with documented contamination, therefore buyers had more information up front.⁷



The asking prices of the sixteen parcels currently on the market reflect the same price discount pattern we saw with the sold parcels (Figure 4). As expected, the adjacent to and suspected to be contaminated because of historical use have been on the market longer than clean parcels. As of November 2, 2000, clean for sale parcels had been on the market an average of 1.5 years, parcels adjacent to contaminated parcels on the market for 3.3 years and parcels suspected of contamination for historical reasons sat on the market for an average of 3.1 years. None of the parcels currently on the market have documented contamination.

Asking Price per Acre of Industrial Property, by Evidence of Contamination,
Current Dollars on November 2, 2000



Barriers to Sale and Redevelopment

An examination of parcels that languished for long periods on the market and those that sold quickly can shed some light on the barriers to industrial land sales. Table 3 compares the parcels that took more than 2 years to sell and parcels that sold within one year. Again, contamination does not appear to be the major deterrent to sale. The quick sellers had as higher probability of being contaminated than the languishers. The striking feature of this comparison is that quick-sellers had an average per acre price of \$314,000 as opposed to the sales price of \$826,000 for parcels that took two or more years to sell. Parcels that were on the market as of November 2000 for more than two years have an average asking price of \$798,000. One barrier to redevelopment appears to be that some sellers misperceive the value of their property.⁸ Howland (2000) similarly found price to be a statistically significant determinant of time on the market, for both contaminated and clean sites, in Southeast Baltimore.

Table 3: Characteristics of Parcels on the Market More than Two Years and Less than One Year

	No. of Parcels	Asking/Sales Price Per Acre	Size in Acres	Extent of Contamination, Percent of Parcels	Average Time on the Market	Percent Unimproved	Accessibility from main road, Percentages
More Than Two Years							
For Sale	8	\$798,319	2.9	.25 clean .25 adjacent .50 historical	3.5 Years	0.13	.5 = one turn .5 = two turns
Sold	10	\$825,937	2.7	.20 clean .20 adjacent .40 historical .20 contaminated	3.4 Years	0	.7 = main road .2 = one turn .1 = two turns
Less Than One Year							
Sold	16	\$312,138	1.8	.37 clean .06 adjacent .31 historical .25 contaminated	.8 Years	0.13	.13 =one turn .63 = two turns .13 =three turns .26 =four turns
Time on the market was not available for all parcels, particularly those sold in the early years of the decade.							

Large parcels do not insure a quick sale. In Carroll Camden, the quick sellers were, on the average, smaller than the languishers. In older industrial areas, unimproved land is often an advantage, because obsolete buildings must be removed before redevelopment can occur. But there is little difference in the proportion of unimproved parcels between the quick sellers and languishers. If the quick sellers exhibited a higher proportion of unimproved land, the unimproved land might have been responsible for the quick sales. In fact, there is little unimproved land in the Carroll Camden area. This district's long industrial history has left behind extensive and often substantial structures.

There is no indication that quick sellers and languishers are concentrated in specific locations. Figures 5 - the quick sellers, and Figure 6 - the languishers show that both are spread over the whole industrial area. The final column in Table 3 indicates the parcel's accessibility. Seventy percent of the parcels that sold after more than 2 years on the market were located on one of the district's main roads and none of the parcels that stayed on the market for more than two

years fell into the most inaccessible category, a location that required three or more turns before reaching a main road. This variable does not measure the quality or width of the roads.

Figure 5

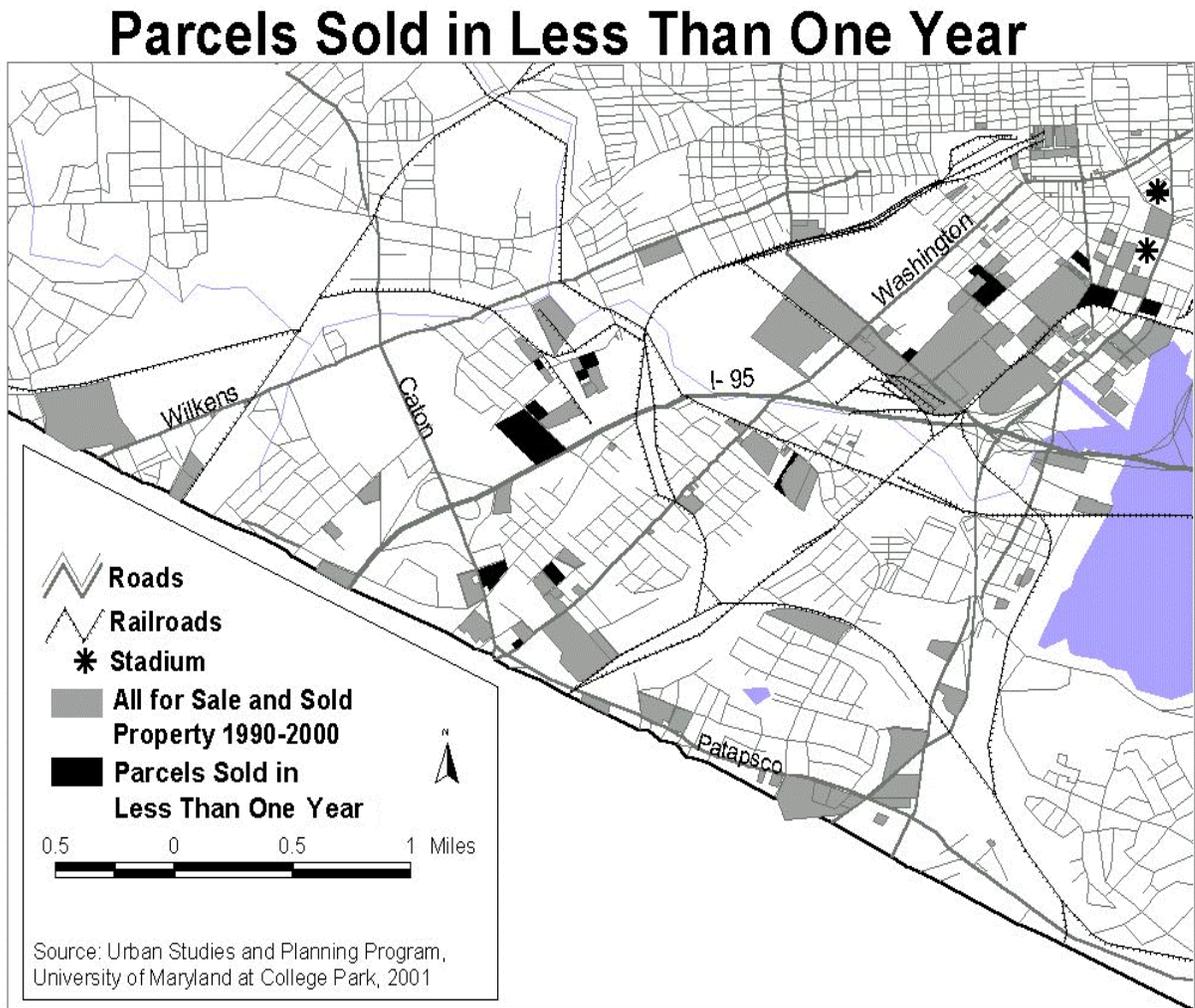
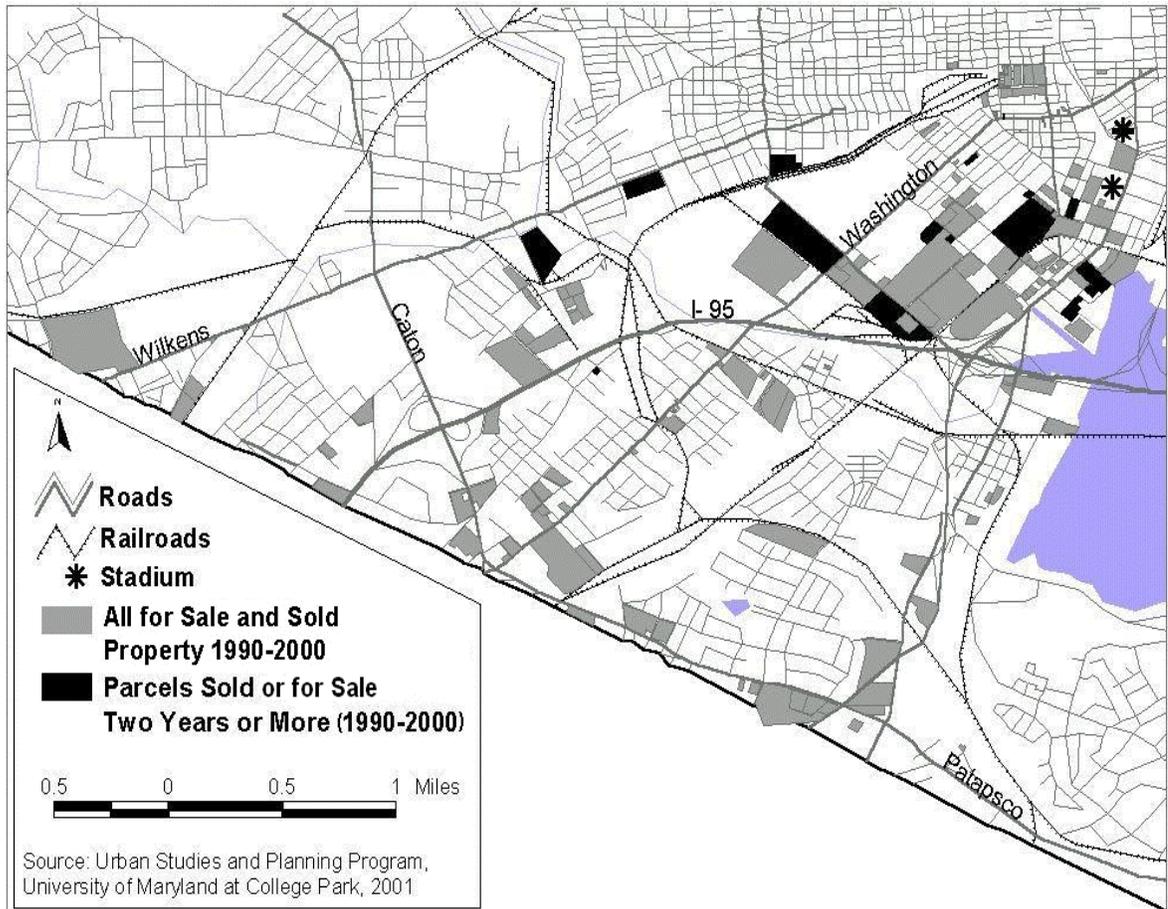


Figure 6

Parcels on the Market Two Years or More



Other Barriers to Resale

We conducted a series of interviews to determine the factors that are barriers to industrial redevelopment. Interviews were held with real estate agents, property owners whose parcels have been on the market for long periods, those who purchased contaminated parcels, and city officials. These interviews highlighted a number of barriers to redevelopment including, small, odd-shaped sites, the expense of removing obsolete structures, obsolete road size and configurations, inadequate water, sewer, and telecommunications infrastructure, existing land uses incompatible

with industry, and the difficulty of changing the land use from industrial to residential use - because housing prices in Baltimore do not compensate for cleanup costs.

Local property and business owners, and real estate agents describe four barriers to a revitalized industrial area. They identified incompatible surrounding land uses, obsolescent road patterns, inadequate water, sewer and telecommunications infrastructure, and outmoded structures as reasons their properties have not sold or as problems of doing business in the area. As a turn-of-the-century industrial city, Baltimore still has residential city blocks integrated with industrial activities. Without the benefit of walking access to work, these blocks have lost their desirability as residential locations. Land values are low, housing conditions poor, and vacancy rates high. Heavy truck traffic and dirty industrial activities (such as a waste management facility) further depress the desirability of these areas for housing. Heavy industry, of the type located in Carroll Camden and many other turn of the century industrial cities, is incompatible with residential activity - even in the current "Smart Growth" environment which favors the integration of land uses. Industrial business land sellers in proximity to residential units have difficulty selling or buyers a reluctance to purchase for fear that their trailer trucks will hit playing children, because of resident objections to heavy truck traffic in off-hours, and because of high rates of theft and vandalism.

Lack of modern truck access also inhibits land sales, particularly in areas where the road width and pattern is incompatible with modern trucking. The current street pattern was laid out for residential use mixed with multi-story, rail-oriented manufacturing, and small scale trucking. Rail dependence has declined, displaced by container trucking. Without modern truck access, industrial parcels are difficult to sell.

In spite of the wide spread view that one advantage of an inner city site is the ready access to

infrastructure, a common grievance among property owners is that water, sewer, and telecommunications facilities are outdated and inadequate⁹. In the Carroll Camden area, land sellers and recent purchasers, as well as operating businesses, complain that water and sewer facilities need updating and expansion and that modern telecommunications linkages are missing.

Fourth, several additional parcels that have failed to sell contain obsolete buildings that are expensive to demolish. In one case, the building was a refrigerated storehouse that could not be renovated or demolished without significant expense. However, in the final analysis, such properties are languishing on the market because the seller's asking price is out of line with demolition costs and the property's productive capacity.

A fifth barrier has arisen on a site the city and a private developer are attempting to redevelop for housing. Even after City subsidies of nearly free land¹⁰ and \$1.9 cleanup, high private costs are pushing the projected final housing prices well beyond what the market will bear in this section of downtown Baltimore.¹¹ Although housing might be the desirable use according to local commercial and residential interests, without massive public subsidies the economics will not support the sale and cleanup of a contaminated industrial site and its conversion to housing.

Conclusion

In terms of its legacy of contamination, the Carroll Camden Industrial district of Baltimore is typical of older industrial districts across the Northeast United States. Our tracking of property sales over the past decade shows that contaminated properties are selling without government intervention and sellers and buyers have adjusted to contamination by lowering prices. Over the decade, parcels with known contamination sold at an average 67% discount, parcels with historical reasons to suspect contamination sold at an average 65 % discount, and parcels adjacent to a contaminated site sold at an average 42 % discount. Only two of these sites entered and completed

the Maryland Voluntary Cleanup program, initiated in 1997.

This conclusion does not imply that federal, state, and local brownfield initiatives are ineffective and unnecessary. Many of the remediation techniques adopted by the private sector were initially tested as part of government sponsored demonstrations. A proven track records on remediation procedures and knowledge accumulated from successful, government-sponsored cleanups reduces risks and costs to the private sector. Moreover, in locations where there is weak market demand, especially toxic and extensive contamination, and/or an intended change in land use to residential, government subsidy and legal protections are critical.

Still, in the emphasis on environmental contamination as an overwhelming obstacle to redevelopment, we may have overlooked other deterrents to central city redevelopment in industrial districts. In Carroll Camden, these barriers are cleanup costs that raise expenditures beyond what a residential market can bear in a weak housing market, outdated road configurations that make truck access and egress difficult, antiquated infrastructure and inadequate telecommunication linkages, a mixture of incompatible and adjacent residential and industrial land uses, and obsolete uses which are expensive to demolish (and where sellers are unwilling to lower the cost sufficiently to compensate). Fortunately, most of these are barriers over which policy makers and city government has control.

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Endnotes

1. The federal government passed the Resource Conservation and Recovery Act in 1976 and the Comprehensive Environmental Response, Liability, and Compensation Act in 1981.
2. This earlier study by Howland (2000) surveyed all property owners in one industrial area over a 2.5 year period. This study, therefore, could identify the time a parcel was on the market prior to sale and cases where parcels were put on the market and then withdrawn without a sale during this period. This study included only three categories of contamination, clean, contaminated and unknown. In this study, the time on the market is missing for many sales early in the decade because the sellers are inaccessible, realtors don't recall, and purchasers often don't know how long the property was on the market. In addition, parcels that went on the market and were withdrawn earlier in the decade would not be captured. The current study includes five categories of contamination.
3. The site is adjacent to the B&O roundhouse and was one of the earliest sites in the U.S. to have access to train transport.
4. The zip codes are: 21075, 21201, 21211, 21216, 21217, 21223, 21225, 21227, 21228, 21229, 21230, and 21234.
5. Only the final sale is captured in this analysis.
6. Not reported here.
7. All the purchasers of contaminated parcels that we interviewed used their own funds. They could not get a bank loan.
8. Real estate agents in the area say that sellers holding out for high prices are unrealistically hoping for the same high figures paid by the Maryland Stadium Authority for the land under Camden Yards or for spinoffs off from the stadium.

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9. DSL-OIT connections are not available to most sites.
 10. The City is selling the land for \$15,000.
 11. For a full description of the site, see Howland, Marie (2001) “Three Case Studies of Brownfield Development”, Urban Studies and Planning Program, unpublished paper.