BENEFITS APPROACH A: SIMPLE PROPERTY VALUE ESTIMATE CHAPTER 2

Approach A addresses benefits related to one important result of the RCRA Subtitle C program: the avoided contamination associated with pre-RCRA facilities that ceased operations rather than upgrade their TSD facilities to meet RCRA standards. The RCRA Subtitle C program is widely believed to be responsible for the closure and/or change in operations of many TSD facilities from the late 1970s through the 1980s. Some of these facilities closed or ceased managing waste prior to the regulations taking effect in 1980, and did not apply for permits as TSDs under Subtitle C. Others operated as RCRA facilities after 1980 but have since closed. A portion of these closed facilities would likely have become hazardous waste sites that would have caused damage to human health and ecological resources in the absence of RCRA.

Approach A would provide a simplified method of estimating benefits of RCRA by projecting the "value" of hazardous waste sites that were avoided due to closures of TSD facilities under RCRA. In other words, the approach estimates the number of pre-RCRA TSDs that would likely have become contaminated (i.e., hazardous waste sites) in the future had they not closed under RCRA. The approach then estimates the "value of an avoided hazardous waste site" by identifying the residential property value loss associated with an "average" hazardous waste site and adjusting for the number of "avoided TSDs likely to have become contaminated." The range of property value losses associated with proximity to hazardous waste sites is estimated using values from the hedonic property value literature.[1]

In addition, the approach calculates an estimate of the value of avoided Superfund cleanup costs associated with the avoided sites. It is not clear from the hedonic literature whether home buyers near "Superfund" sites expect remediation, and incorporate that expectation into their purchase prices. We therefore present two scenarios for Approach A - a "with-remediation scenario" and a scenario net of remediation. Also, while we assume that hazardous waste sites absent RCRA

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[1] Hedonic studies identify the value of "quality of life" amenities such as clean water by examining differences in housing prices with regard to the presence or absence of the amenity. For a complete discussion of the hedonic property value literature relevant to hazardous waste sites and RCRA, see Appendix A.

would have had property value effects equivalent to "Superfund" sites, we would base cleanup cost estimates on average site remediation costs for both NPL and non-NPL sites (and, if possible, state hazardous waste sites).

2.1 ATTRIBUTES MEASURED

Property value effects (i.e., the loss in value that an average home suffers as a result of proximity to a waste site) provide a simple measure of the values that homeowners place on a bundle of economic goods that accompany a property. These values include the following RCRA attributes:

- **Human Health:** housing prices may include the value of perceived risks to human health (including both long-term and acute risks).

- **Ecological Services:** housing prices may reflect the values of local ecological services, including both recreational and commercial resources.

- **Avoided Costs:** possible costs associated with substitute drinking water sources, reduced water usage, and other activities associated with response to contamination may be incorporated into housing values.

- **Historic and Aesthetic Amenities:** house values include consideration of a number of local amenities that can be affected by both polluting facilities and cleanup activities. Values may reflect damage to historical structures from pollution and aesthetic disamenities such as noise from trucks and extensive cleanup activities.

- **Economic Impacts:** local economic opportunities, including those affected by RCRA (e.g., plant closures and job opportunities with environmental service firms) may be a component of property values.[2]

In addition, a key determinant of property value changes near Superfund sites appears to be the intensity of feeling about the site and the value of information available about the site and associated risks. These stakeholder concerns are implicitly reflected in bundled property values, but do not reflect separate "goods."

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[2] Local housing market responses to contaminated sites may incorporate local economic impacts and may reflect the extent of local stakeholder concerns; however, we also discuss these attributes again in later sections. In Chapter 7 (Distributional Impacts) we address national economic impacts associated with RCRA over the history of the program; in Chapter 8 (Program Context Attributes) we address Stakeholder Issues as they relate to policy development under RCRA.

Approach A measures the value of these attributes by estimating the avoided property value effects associated with hazardous waste sites "avoided" under RCRA. However, while the estimate incorporates or reflects the above attributes, it does not isolate the value of any particular attribute. In addition, there are two key areas of uncertainty in this approach: the number of sites avoided by RCRA that would have become contaminated in the absence of the Subtitle C regulations, and the magnitude of the property value effect (expressed as a percentage of the original property value). For these two values we present a range of estimates. Exhibit 2-1 illustrates the determinants of a range of results from this analysis, and the potential format that could be used to present the results of the analysis.

Exhibit 2-1

SAMPLE RESULTS OF APPROACH A: PROPERTY VALUE ESTIMATE

Scenario	High-End Property Effect	Average Property Effect	Low-End Property Effect
Assume all land disposal facilities avoided by RCRA would become hazardous waste sites	highest estimate		
Assume 75 percent of facilities avoided by RCRA would become hazardous waste sites			
Assume 50 percent of facilities avoided by RCRA would have become hazardous waste sites			
Assume 25 percent of facilities avoided by RCRA would have become hazardous waste sites			lowest estimate

Notes: The property value range is developed by considering average range of property effects at Superfund and other hazardous waste sites in the literature. Key assumptions that drive the extent of property value effects include the population density and the initial value of housing within a given site radius.

2.2 OUTLINE OF APPROACH A

Approach A would involve four basic analytic steps. Steps 1 and 2 would estimate the pre-RCRA population of facilities, and the number of facilities that closed or ceased managing hazardous waste as a result of RCRA regulations. Step 3 estimates the number of closed facilities that would have become hazardous waste sites requiring remediation in the absence of RCRA. Step 4 would estimate the avoided property value declines and cleanup costs associated with the avoided hazardous waste sites identified in Step 3. Below we describe these steps in more detail.

2.2.1 *Step 1. Identify Pre-RCRA population of TSDs*

Approach A focuses on the closure of land disposal facilities with pre-RCRA TSD practices. The pre-RCRA universe contained two basic types of land disposal facilities for hazardous waste: on-site waste disposal facilities at hazardous waste generators, and off-site facilities that receive waste from other entities (this includes both commercial hazardous waste facilities that were already in operation and non-specific solid waste landfills). We have identified two separate sources to estimate the pre-RCRA universe of each of these facility types:

- **On-Site Facilities:** EPA *Industry Assessments* for various industries (published throughout the 1970s) estimate the number of facilities managing hazardous waste in several key industrial sectors; each *Assessment* provides considerable detail about the waste quantities, constituents, and disposal practices that characterized the industry prior to the passage of RCRA.

- **Off-Site Facilities:** *1979 Waste Disposal Survey* Report to Congress. This document lists over 3000 landfill locations, along with disposal dates and types of waste, where the 53 largest chemical companies in the United States disposed of their wastes between 1950 and 1975.

Our proposed approach would estimate the universe of pre-RCRA TSDs in two parts. The number of pre-RCRA generating facilities with on-site TSD units would be equal to the number of facilities identified in the *Industry Assessments* as having on-site disposal, treatment, or long-term storage. We would estimate the universe of pre-RCRA off-site disposal facilities as the off-site facilities in the *1979 Waste Disposal Survey* that received hazardous waste after 1970.

Both of these universe estimates are incomplete. The *Industry Assessments* address only a subset of the industries (identified by Standard Industrial Classification (SIC) codes) that are regulated under RCRA, and the *1979 Waste Disposal Survey* omits any landfills that took waste only from companies other than those polled. However, while neither source provides a complete picture of hazardous waste practices prior to RCRA, they do provide a low-end estimate of the pre-RCRA TSD population in the important waste producing industries based on contemporaneous information.[3]

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[3] We are not able to quantify the portion of the RCRA universe that is omitted by these facilities, but other pre-RCRA studies and later BRS data consistently indicate that the industries targeted in the *Industry Assessments* do represent the majority of hazardous waste generated. Similarly, while it is very difficult to identify the quantity of pre-RCRA "hazardous waste" that was disposed off-site, pre-RCRA studies indicate that the majority of waste was disposed on-site.

In addition to the above studies, we explored a large number of contemporaneous information sources that described various aspects of the pre-RCRA universe. Useful sources of information on landfills included EPA's 1982 *Inventory of Open Dumps* and *Waste Age's* 1977 *Land Disposal Practices Survey* update. Detailed contemporaneous sources of information on generators and managers of hazardous waste include a 1979 report by the New York Department of Environmental Conservation titled *Industrial Hazardous Waste Generation in New York State,* EPA's 1982 *Surface Impoundment Assessment National Report,* and EPA's 1979 *Economic Impact Analysis of Hazardous Waste Management Regulations on Selected Industries.*

We could use these studies to supplement information about the facilities and practices of the pre-RCRA universe. However, we believe that the *Industry Assessments* provide the most consistent and detailed view of waste management practices in multiple industry sectors, and that the *1979 Waste Disposal Survey* Report to Congress provides the most extensive list of landfill sites with specific information about location, site ownership, type of waste disposed at the site, and specific time intervals during which disposal occurred.

2.2.2 *Step 2. Identify "Avoided TSD Facilities"*

Our proposed approach would identify "avoided TSD facilities" by performing a simple bounding analysis of the total change in the number of TSD facilities in SIC codes described in *Industry Assessments* and the *1979 Waste Disposal Survey*.[4]

- **Low-end estimate of avoided facilities**. For this estimate we subtract the 1981 *Generator Survey's* estimate of TSDs for specific SIC codes from the pre-RCRA universe of TSDs. This estimate assumes that all avoided facilities closed immediately, and that any closures or conversions after 1981 were not attributable to RCRA.

- **High-end estimate of avoided facilities**. For this estimate we identify the number of TSDs in the most recent Biennial Reporting System (BRS), and adjust populations to exclude facilities in SIC codes not addressed in industry studies on off-site management by 1980 regulations and those handling only wastes that were regulated after 1980. This would provide a consistent basis for comparison with facilities initially regulated under RCRA. We then subtract the adjusted BRS population from our pre-RCRA universe of TSDs. This estimate of avoided TSDs reflects actual economic growth and industry consolidation, and assumes all closures both before and after 1980 are due to

[4] We expect to use SIC code 4953 to identify commercial solid waste disposal operations and compare these with the off-site disposal facilities identified in the *1979 Land Disposal Survey.*

RCRA. The estimate will be high to the extent that it includes many facilities that closed for reasons other than RCRA.[5]

The result of this analysis is a high and low estimate of the total number of TSD facilities in relevant industries (i.e., SIC codes) that ceased operations due to RCRA regulations.

2.2.3 *Step 3. Estimate Number of "Avoided Hazardous Waste Sites"*

Our proposed approach assumes that a percentage of avoided TSDs would have experienced sufficient contamination in the absence of RCRA to require remediation under Superfund or other hazardous waste remediation programs. EPA's 1993 *Corrective Action RIA* estimates that 44 percent of RCRA facilities subject to Subpart S Corrective Action (that is, facilities with pre-RCRA solid waste management units on site) are expected to have past, current, or future releases that will require Corrective Action. Future failure rates are based on expert panel engineering estimates of structural failure at pre-RCRA facilities.[6] The RIA does not identify the percentage of facilities that were already contaminated in 1982.

While we believe the RIA's estimate of 44 percent failure represents a reasonable central tendency assumption for the likelihood of failure at a pre-RCRA facility, we cannot simply apply this percentage to the number of avoided TSDs to determine avoided hazardous waste sites. There are two key considerations in estimating hazardous waste sites avoided by RCRA:

- Some sites were likely to be contaminated prior to 1980 and have or will become hazardous waste sites despite the implementation of RCRA. These sites do not represent "avoided" damage due to RCRA and should not be included in the benefits of the program.[7] We must therefore adjust the

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[5] The estimate may also be low if the 1995 BRS includes as TSDs many facilities that "converted" from generation and disposal to generation only. However, it may be possible to account for these facilities using BRS estimates of quantity of waste disposed; for example, TSDs in BRS (i.e., WR, or waste received, facilities) that have not received waste in over two BRS reporting cycles could be considered "avoided TSDs."

[6] Environmental Protection Agency. *Regulatory Impact Analysis for the Final Rulemaking on Corrective Action for Solid Waste Management Units Proposed Methodology for Analysis.* Draft, (1993), p. 3-27. Because all Subpart S Corrective Action Facilities stopped receiving waste prior to July 1, 1982, the estimate addresses only pre-RCRA practices and wastes.

[7] This assumption underestimates the potential benefits of RCRA, which likely prevented even contaminated sites from becoming more contaminated and potentially more damaging. However, hedonic property value studies are not precise enough to identify the impacts of marginal

number of avoided TSDs to reflect only the number of avoided TSDs *without existing contamination*. We do not know the number of sites that were already contaminated when they ceased operations; we therefore propose a range of values for "number of sites already contaminated" and subtract these estimates from the total number of avoided hazardous waste sites estimated.[8]

- The sample of facilities in the *Corrective Action RIA* may not be representative of avoided TSDs that ceased operations under RCRA; therefore the actual percentage of facilities that would have become contaminated may be more or less than the 44 percent estimated in the RIA. For example, facilities that closed due to RCRA may have been poorly managed and more likely to leak than those that stayed open; this would increase the expected number of Superfund sites had those facilities continued to operate. It is also possible that avoided TSDs closed or reconfigured as preventative measures and are less likely to experience failure and contamination. Again, to address this uncertainty we propose to present a range of estimates for the likelihood of contamination.

For example, a worst case scenario under Step 3 would assume that a low percentage of avoided TSDs have prior contamination (i.e., the number of eligible avoided TSDs is likely close to the total number of avoided TSDs) and all would have become hazardous waste sites without RCRA (i.e., a 100 percent chance of future contamination). In contrast, a very conservative scenario would assume that a high percentage of avoided TSDs were contaminated at closure (and therefore do not represent benefits of the RCRA program) and that only 25 percent of the clean facilities would have become hazardous waste sites in the absence of RCRA. Note that the 1979 New York *Inventory of Industrial Hazardous Waste Generation* concluded that a significant percentage of wastes in that state were mismanaged. If this study is representative of national waste management practices, it is likely that both the number of facilities already contaminated in 1980, and the number likely to become contaminated had disposal practices continued, would be high.[9]

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changes in contamination at existing sites. We therefore eliminate these impacts from consideration.

[8] For example, if Step 2 estimated that 100 TSDs closed due to RCRA, and the *Corrective Action RIA* estimated that 44 of those sites would eventually become contaminated, we would adjust this number (i.e., 44) to reflect different assumptions about existing contamination. The resulting range of estimates may range from a fairly conservative estimate of 11 avoided sites (assuming that 75 percent of closed TSDs were already contaminated at closure) to a more aggressive estimate of 33 (assuming that only 25 percent of closed TSDs were already contaminated at closure).

[9] Prepared by Bureau of Hazardous Waste, Division of Solid Waste Management, New York State Department of Environmental Conservation, June 1979.

We emphasize that this step is associated with considerable uncertainty. It is impossible to "know" or estimate the probability of contamination without identifying and examining the specific facilities that closed. Because there are no complete records of closures that would otherwise have been regulated TSDs, we must address uncertainty by presenting a range of potential results. We also recommend that any implementation of this step include a review of new literature that might address some of the uncertainty associated with the probability of contamination.

2.2.4 *Step 4. Assign Values to Avoided Hazardous Waste Sites*

Approach A would estimate the value of an "avoided hazardous waste site" considering two scenarios that make different assumptions about the expectations of property owners. Scenario 1 would assume that property values incorporate no expectation of cleanup, and reflect the entire value placed on the risks and damage associated with perpetual site contamination. For Scenario 1 we would estimate avoided losses in property values proximate to the avoided hazardous waste sites. Scenario 2 would assume that housing values near Superfund sites reflect owners' expectation of site remediation, and therefore value only finite exposure and damage associated with the site. For this scenario we would add avoided site remediation costs to the property value changes identified in Scenario 1.[10] In both scenarios, the total benefits of the RCRA program identified in approach A represent the sum of the values of all avoided hazardous waste sites.[11] Below we present the calculations for both scenarios:

2.2.4.1 Estimate of Avoided Property Value Losses (Scenarios 1 and 2)

Our calculation of avoided property value losses is based on three parameters:

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[10] The hedonic property value literature highlights the importance of information as a determinant of housing value changes near hazardous waste sites. Several studies indicate that property values decline most rapidly as people first learn about contamination, and recover to some extent as information about cleanup becomes available. Based on these findings, we believe it is possible that property value declines may also reflect the expectation of cleanup; in other words, the declines reflect the present value of disamenities with a finite time length until cleanup is complete. We would therefore incorporate the costs associated with that cleanup into our scenario. We recognize that this is an assumption that has yet to be tested in the literature, and propose two separate analyses that would reveal the magnitude of the effects of this assumption.

[11] Approach A does not attempt to adjust benefits to reflect the timing of avoided hazardous waste contamination incidents (i.e., apply a discount rate to benefits) because it is impossible to predict the occurrence of avoided events. Approach A's undiscounted estimate effectively assumes that hazardous waste sites would have occurred consistently from 1980 through 2020.

- **Average percentage decrease in property value** expected within a certain radius of a hazardous waste site.[12] Our preliminary literature review indicates that most property value effects related to proximity to a hazardous waste site fall between two percent and eight percent of original house value. However, some studies indicate price effects of zero percent to twenty percent. For detailed discussion of the literature review, see Appendix A.[13]

- **Median population density** within a certain radius of a hazardous waste site. Population density is an essential variable in assigning values losses to Superfund sites, since value losses will be greater in areas where a greater number of houses are affected. Median density can be determined using a simple spatial analysis that identifies the number of CERCLIS and RCRA TSDs per county and uses U.S. Census data to determine county average density.[14] Spatial analysis of a sample of sites could identify uncertainty associated with the use of county average density estimates.

- **Median housing values** within a certain distance (e.g., one mile) of a Superfund site. This requires a simple spatial analysis of CERCLIS sites and RCRA TSDs, coupled with a weighted average of median housing values in the counties in which sites occur. Median house values can be found in

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[12] While several studies find property values effects up to seven miles from a hazardous waste site, we propose to limit our focus to a one mile radius (with three and five mile sensitivity analyses) and assume that the majority of property value effects will be captured within this range. This range is consistent across the literature, regardless of whether studies assess Superfund sites or other types of disamenities (e.g., landfills, incinerators). We found no clear pattern of values that distinguishes among types of disamenities.

[13] Again, information appears to be a key determinant of housing value changes near hazardous waste sites. Several studies conclude that property values decline most rapidly as people first learn about contamination, and start recover as information about cleanup becomes available. Our benefits estimate does not consider the timing of cleanups or the pattern of property value losses and recoveries while cleanup continues. We do note, however, that the literature is not conclusive with respect to the "rebounding prices" issue. While some studies indicate full recovery of prices upon site remediation, others find partial or even minimal rebound, which may be attributable to stigma. There is also some indication of the potential for RCRA *dis*benefits, resulting from the siting and/or "labeling" of operating facilities with RCRA permits.

[14] We assume that this range of pre- and post-RCRA sites (i.e., Superfund sites and TSDs) represent a wide range of industrial facilities and are similar in location requirements (e.g., resources, space) as the "missing" hazardous waste sites of interest. In other words, we examine CERCLIS and RCRA TSD sites as a representative distribution of "missing" industrial sites.

county Census data. Because we are applying an average percentage decrease in property values, sites surrounded by more expensive homes will induce greater monetary losses. Again, spatial analysis of a sample of sites could identify possible uncertainty associated with use of county averages.

In summary, the calculation of total property value losses avoided by RCRA in Approach A is:

(# of avoided sites) x (percentage value decrease) x (# houses within one miles) x (average house value)

We would assign a range of percentage decreases in property values to reflect the variation in property values literature. Thus, the result of the analysis will be a range in total property value losses avoided due to avoided hazardous waste sites. We emphasize that the property value approach distinguishes between the existence and non-existence of a disamenity, but is not useful for distinguishing subtle differences in management practices. Additionally, the resulting "value" of the avoided site characterizes a bundle of goods that cannot be isolated and valued separately. In other words, the property value approach is not useful for measuring individual attributes *per se* or describing "environmental outcomes" resulting from the RCRA program, but instead provides a "lump sum" value for all relevant attributes. See Appendix A for a more extensive discussions of the limitations of the hedonic approach.

2.2.4.2 Avoided Costs of Hazardous Waste Site Remediation (Scenario 2 only)

Our second scenario would produce a benefits estimate that includes both the avoided property value losses outlined above, and the avoided costs of site remediation (under Superfund or comparable programs). Avoided government-mandated remediation costs represent another potential benefit of avoided hazardous waste sites, because they are baseline (i.e., without RCRA) costs that are eliminated by the regulation. Scenario 2 would therefore add these costs to the property value effects associated with sites in order to calculate the total value of avoiding hazardous waste sites, using the following steps:

- A Congressional Budget Office Study (1994) provides one estimate of non-federal Superfund cleanup costs. The document presents a range of cost estimates (base case, high case, low case) for "mega-sites," "major sites," and "minor sites." They find an average present-worth cost for all NPL sites of $28.5 million to $31.2 million (1992 $). Approach A will adapt these cost estimates and derive an "average" site value.[15]

[15] While these estimates are useful, Approach A requires two adjustments. First, we do not assume that all avoided hazardous waste sites would have become NPL sites; therefore, it is

- These figures can be used to determine the median net present value (1999$) of a remediation under the Superfund program. Again, sampling of site-specific costs can characterize uncertainty with regard to use of this median.

Scenario 2 assumes that property value responses to hazardous waste sites *reflect the expectation of clean-up*. In other words, purchasers of property near hazardous waste sites assume that the site will be remediated and that human health and other disamenities are not permanent. If this is true, then avoided cleanup costs must be added to housing value declines to provide a complete estimate of benefits. We believe that this assumption is consistent with the findings of various studies that housing prices respond to information about risk and cleanup activities. However, more research on home purchasing decisions is necessary to test the validity of the assumption that homeowners anticipate cleanup. In the absence of additional research, analysts should consider alternate scenarios (i.e., both Scenarios 1 and 2) in which cleanup costs are included and excluded to determine the potential role of these avoided costs in the total benefits of RCRA.

While avoided government-mandated remediation costs can be considered in any analysis of RCRA, there is a potential double-counting of benefits because property value effects may reflect an unremediated hazardous waste site and thus address, in part, the value of cleaning the site (i.e., by identifying the negative value of allowing the site to remain). However, if homeowners purchase houses near hazardous waste sites with the expectation that remediation will take place, the housing values near Superfund sites may stay higher that they otherwise would have, reflecting the assumption that exposure to contamination is limited. If this is the case, then remediation costs can be added to property values and there is no overlap.

Note that there is an important distinction between the *cost* of site remediation and the *value* of site remediation. In Scenario 2 we do not attempt to identify the economic value (in terms of willingness-to-pay) to remediate a hazardous waste site; this value could be greater than or less than the cost of site remediation. In Scenario 1, however, we assume that the value associated with avoiding a hazardous waste site is included in the property value effect. Since we do not know the exact relationship between the *cost* of remediation and the economic *value* of remediation, we limit our Scenarios to explicit consideration of one or the other, but not both.

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important to determine a reasonable average of non-NPL Superfund sites. Second, since CBO (1994) assesses only non-federal (private sector) cleanups, it is necessary to account for cleanup costs of federal sites. State and/or EPA data can provide this information, but should be adjusted for uncharacteristically high-cost outliers such as large-scale Department of Defense facilities.

2.3 SUMMARY FOR APPROACH A: PROPERTY VALUE BENEFIT ESTIMATE

This simple approach identifies economic benefits and impacts as total residential property value losses avoided by RCRA due to avoided hazardous waste sites.[16] The approach potentially values the following attributes as a part of the property value perceived by nearby residents:

- Human health benefits;
- Ecological benefits;
- Avoided costs of alternate water supplies; and
- Aesthetics and historic preservation.

These values are bundled into a single property value increment that may also reflect certain stakeholder concerns and local economic impacts. Though these attributes are implicitly included in housing values, the value of each individual attribute cannot be isolated using Approach A. The sum of the values associated with avoided sites represents the benefits of RCRA.

In addition, Approach A requires the development of an alternative scenario (Scenario 2) that adds the average cost of remediation under the Superfund program to property value losses for a total estimate of the costs avoided under RCRA. This scenario assumes that property values near Superfund sites reflect the owners' expectations of site remediation. The sum of the avoided property value declines and avoided remediation costs (expressed as a range of values based on the percentage reduction in property values near avoided sites) gives total costs avoided as a result of avoiding hazardous waste sites under RCRA. Exhibit 2-2 summarizes the methodological steps in Approach A.

In addition, because of the significant uncertainties associated with estimates of facility closures and contamination levels, we recommend the following sensitivity analyses to determine the importance of several variables:

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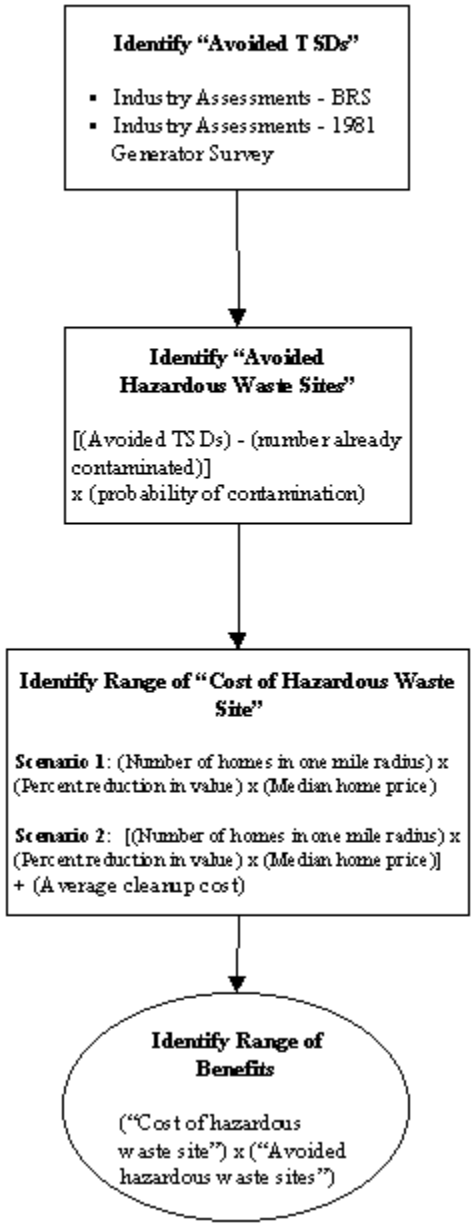
[16] Note that the property value assessment in Approach A considers only residential property. This approach could exclude considerable property value effects in commercial districts. While we assume that the cost of remediation captures the change in property value on the contaminated property itself, some studies indicate that property values of commercial properties proximate to, but not associated with, the contaminated property may suffer price effects in excess of those observed at residential properties. Implementation of Approach A should include an examination of recent literature to determine whether consideration of commercial properties is warranted. See Appendix A for additional detail.

- **Number of facilities avoided by RCRA:** A bounding analysis of facilities closed by 1981 and total facilities closed as reported in the most recent BRS;

- **Number of hazardous waste sites avoided by RCRA:** A sensitivity analysis reflecting a range of contamination scenarios.

Exhibit 2-2

SUMMARY OF APPROACH A



2.3.1 *Limitations of the Property Value Approach*

Approach A provides a general estimate of a key portion of RCRA benefits without demanding considerable resources. However, the approach does not examine several key aspects of the RCRA program. The major limitations of this approach are:

- The estimate of avoided TSD facilities considers only facilities in industries for which EPA performed pre-RCRA *Industry Assessments.* Newly regulated industries that have been addressed by RCRA more recently than 1980 are not included; nor are changes in the management of newly regulated wastes not included in the 1980 regulations (however, if new waste regulations are responsible for facility closures since 1980, then these closures are considered in the high-end estimate of avoided TSDs).

- The approach examines only TSD facilities - avoided hazardous waste sites associated with generating facilities are not included (i.e., avoided damage associated with poor storage and short-term management practices at facilities that were never identified as TSDs).

- The approach does not identify the benefits of improved waste management practices and reduced waste generation at existing TSDs and generators. RCRA regulations are likely to have reduced releases at operating facilities, and the benefits from the changes in practice may be a considerable portion of the benefits of the RCRA program.

Exhibit 2-3 illustrates the results of Approach A in the context of the total benefits of RCRA. In addition, separate analyses of long-term benefits, program costs, distributional impacts (e.g., equity and economic impact analyses), and program context attributes (e.g., program constraints) should be undertaken to complete the analysis.[17] Note that while this approach addresses only one aspect of the benefits of the RCRA Subtitle C program, it could potentially account for a large portion of RCRA benefits by itself and may therefore be useful information even if a full analysis of RCRA costs and benefits is not performed.

[17] Methodologies for addressing these additional attributes are described in Chapter 4 (Long-Term Benefits), Chapter 5 (Costs), Chapter 6 (Distributional Impacts), and Chapter 7 (Program Context Attributes).

Exhibit 2-3

CONCEPTUAL VIEW OF APPROACH A RESULTS