National Emission Standards for Hazardous Air Pollutants: Site Remediation

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National Emission Standards for Hazardous Air Pollutants: Site Remediation

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LIST OF ACRONYMS

BRS:	Biennial Reporting System
CAA:	Clean Air Act
CSR:	Cost-to-sales ratio
EIA:	Economic impact analysis
EPA:	U.S. Environmental Protection Agency
GDP:	Gross domestic product
HAPs:	Hazardous air pollutants
LQG:	Large Quantity Generator
MACT:	Maximum achievable control technology
MIRR:	Monitoring, inspections, recordkeeping, and reporting
NAICS:	North American Industrial Classification System
NESHAP:	National Emissions Standard for Hazardous Air Pollutants
NPL:	National Priorities List
NSPS:	New Source Performance Standards
NTI:	National Toxics Inventory
OAQPS:	Office of Air Quality Planning and Standards
OSWRO:	Off-Site Waste and Recovery Operations
RCRA:	Resource Conservation and Recovery Act of 1976
ROS:	Return-on-sales
SIC:	Standard Industrial Classification
SVE:	Soil vapor extraction
TSD:	Treatment, Storage, and Disposal
VOCs:	Volatile organic compounds

SECTION 1

INTRODUCTION

The Clean Air Act's (CAA's) purpose is to protect and enhance the quality of the nation's air resources. To accomplish this goal, the Act vested the U.S. Environmental Protection Agency (EPA) with the authority to establish national emission standards for 188 hazardous air pollutants (HAPs) that cause or may cause adverse health effects or adverse environmental and ecological effects.[1] EPA has determined that site remediation activities can be sources of organic HAPs (including benzene, ethyl benzene, toluene, vinyl chloride, and xylenes) and other volatile organic compounds (VOCs). The range of potential human health effects associated with exposure to these organic HAPs and VOCs includes cancer, aplastic anemia, upper respiratory tract irritation, liver damage, and neurotoxic effects (e.g., headache, dizziness, nausea, tremors). The proposed rule would implement Section 112(d) of the CAA by requiring those affected site remediation activities to meet emission limitation, operating limit, and work practice standards reflecting the application of the maximum achievable control technology (MACT).

1.1 Agency Requirements for an EIA

Congress and the Executive Office have imposed statutory and administrative requirements for conducting economic analyses to accompany regulatory actions. Section 317 of the CAA specifically requires estimation of the cost and economic impacts for specific regulations and standards proposed under the authority of the Act.[2] The Office of Air Quality Planning and Standards' (OAQPS') *Economic Analysis Resource Document* provides detailed instructions and expectations for economic analyses that support rulemaking (EPA, 1999b). In the case of the site remediation MACT standard, these requirements are fulfilled by providing an overview of potential

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[1]EPA must periodically review the list of HAPs and, where appropriate, revise this list by rule. In addition, any person may petition EPA under Section 112(b)(3) to modify the list by adding or deleting one or more substances.

[2]In addition, Executive Order (EO) 12866 requires a more comprehensive analysis of benefits and costs for proposed *significant* regulatory actions. Office of Management and Budget (OMB) guidance under EO 12866 stipulates that a full benefit-cost analysis is required only when the regulatory action has an annual effect on the economy of $100 million or more. Other statutory and administrative requirements include examination of the composition and distribution of benefits and costs. For example, the Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement and Fairness Act of 1996 (SBREFA), requires EPA to consider the economic impacts of regulatory actions on small entities.

- industry-level impacts and
- societal-level impacts (qualitative discussion).

1.2 Summary of the Source Category

Site remediation is one of the approximately 170 categories of sources included in the National Emissions Standard for Hazardous Air Pollutants (NESHAP) source category list. Sites undergoing remediation include, but are not limited to, voluntary cleanup actions and underground storage tank sites. However, not all sites will be subject to the rule. Site remediation includes, but is not limited to, the following activities: contaminated soils cleaning, soil vapor extraction (SVE), and groundwater cleanup or removal of hazardous substances. Site remediation does not include remediation activities at gasoline stations, cleanup of contamination at farm or residential sites, or the installation of controls at municipal solid waste landfills to comply with the New Source Performance Standards (NSPS) or CAA, Section III(d) emission guidelines (Nizich, 2001). Superfund NPL sites and permitted or federal order RCRA corrective action cleanups are exempted from the rule.

The site remediation source category potentially includes a wide variety of industries. Because site remediation activities are not specific to a particular industry or process, creating a comprehensive list of all potentially affected industries is not possible. For the economic impact analysis, EPA used the 1997 Biennial Reporting System (BRS) database to identify a sample of facilities that generated remediation wastes in 1997 and who might have been subject to the rule if the rule had been enacted in that year. The data were used to estimate the quantity of remediation wastes generated by various regulatory categories, the physical form of the remediation wastes generated (e.g., inorganic liquids, organic solids, or organic sludges), and the quantities and methods used to manage and treat the remediation wastes on-site (e.g., incineration, aqueous organic treatment, or stabilization). The Agency believes that the 1997 BRS database provides a fair representation of nationwide baseline conditions for site remediations activities. A comparison of the total quantity of remediation-derived wastes reported in the BRS database for the years 1993, 1995, and 1997 showed that the total quantity of remediation waste treated on-site for these years remained about the same, approximately 22 million tons (Nizich, 2001).

The engineering cost analysis (Zerbonia, 2001) indicates that 490 different Standard Industrial Classification (SIC) codes had facilities generating remediation waste streams in 1997. Of these, four SIC codes generated more than 500 waste streams per code, 28 SIC codes generated more than 100 waste streams per code, 48 SIC codes generated more than 50 waste streams per code, 84 SIC codes generated more than 25 waste streams per code, and 190 SIC codes generated 10 or more waste streams per code. Major industry sectors that are engaged in site remediation activities include industrial organic chemical manufacturing, petroleum

refining, waste management (refuse), plating and polishing, aircraft, and semiconductors to list a few.

1.3 Summary of Potential Economic Impacts and Market Adjustments

Implementation of the proposed rules will increase the costs of production at affected facilities. The response of producers to the additional production costs associated with rule compliance and the response of consumers to changes in market conditions determine the economic impact of the regulation. The proposed rule may influence firms' choices of remediation activities. For example, they may elect not to conduct the remediation or the increased costs associated with on-site control of air emissions may encourage firms to use off-site treatment for any remediation wastes generated. As a result, demand for off-site remediation waste management services will likely increase, placing upward pressure on prices that would in turn reduce the quantity of services demanded in this market. In addition to off-site remediation waste materials management and treatment services, higher production costs for products supplied by firms affected by the rule (i.e., higher on-site remediation costs and higher off-site remediation service prices) may result in changes in the markets for their particular products. Higher production costs can lead to reduced production of commodities and/or increased prices for commodities. These potential changes in market prices and output will in turn affect society's welfare through losses to consumers and producers.

As discussed above, the site remediation source category can include a large variety of industries. Although the BRS database provides information on which firms might have been affected if the rule had been implemented in 1997, EPA does not have information on the industries and firms that will actually be affected when the rule is implemented. By the date at which the rule is implemented, the remediation projects ongoing in 1997 will most likely be finished. Given the lack of certain information on the affected industries and facilities and the large number of potentially affected industries, we can only examine the general implications of the rule using industry-level data from the most recent Economic Census (U.S. Bureau of the Census, 2000). Given the uncertainty about which firms would be impacted, EPA determined that the most appropriate way to analyze the industry data was at the SIC level because the BRS data used the SIC system and the bridge between the SIC and NAICS codes was not one-to-one. However, we also report the corresponding NAICS codes associated with the 15 industries in the economic impact analysis.

The Agency employed an engineering or financial analysis that takes the form of estimating impacts through the ratio of compliance costs to the value of sales (cost-to-sales ratio or CSR) using total industry revenues, control costs, and accounting measures of profit. The analysis assesses the burden of the rule by assuming the affected industries fully absorb the control costs, rather than passing them on to consumers in the form of higher prices. One

drawback of this approach is that it does not consider interactions between producers and consumers in a market context. It is likely that some percentage of the control costs may be passed along to other parties through various economic exchanges, in particular in the form of higher prices for consumers. Therefore, it likely overstates the impacts on facilities and firms affected by the rule and understates the impacts on consumers. The primary advantages of this approach are its simplicity and its relatively limited data requirements.

Out of the 490 different SIC codes that had facilities generating remediation waste streams in 1997, over 80 SIC codes were predicted to have annual compliance costs as a result of the rule, and 15 industries accounted for 91 percent of the total annual compliance costs of $7.96 million.[3] For the 12 industries with revenue data, all had CSRs less than 0.02 percent. Profitability data for the SIC codes also show the lower quartile return on sales for industries with data was between 0.4 and 1.8 percent (Dun & Bradstreet, 1997). None of the industries was shown to have a CSR in excess of the lower quartile return on sales. Given the information available to the Agency, it does not appear that the rule would impose significant costs on the potentially affected industries. However, as discussed in more detail in the report, the nature of the proposed rule and the data makes fully assessing the impact of the regulation difficult.

Small business impacts were particularly difficult to assess. As discussed in the Preamble, this rule sets minimum standards to be met when parties engage in future site remediation activities, but it does not itself require any party to undertake such activities. States may choose to direct a party to undertake site remediation, or parties may undertake remediation activities voluntarily. EPA anticipates that parties that undertake site remediation generally will do so voluntarily and that the impact of this rule on those parties will not be significant. Further, because States and other parties will decide whether to undertake site remediation activities, it is extremely difficult, if not impossible, to predict how many or what types of small entities will undertake such activities. The rule is structured to avoid impacts on small businesses. The rule specifically excludes from its scope remediations conducted at gasoline stations, farm sites and residential sites (on the ground that these remediations would not exceed the threshold for major sources). Moreover, the rule would apply only to remediation sites located at a facility that is a major source under the Clean Air Act and engages in a "MACT activity" (defined as a non-remediation activity covered in the MACT list of major source categories pursuant to CAA section 112 (c)). Such sources tend to be large businesses. The rule also contains emission thresholds that are not likely to apply to small businesses. For example, the rule exempts sources where the total annual quantity of HAP contained in all extracted remediation material at the facility is less than 1 megagrams (Mg) per year. For these reasons, EPA certifies that the

[3]$1997. EPA adjusted the $2000 estimates using a cost factor (0.9753) developed from the Chemical Engineering Composite Plant Cost Index.

rule, if promulgated, will not impose a significant economic impact on a substantial number of small entities.

1.4 Organization of this Report

The remainder of this report supports and details the methodology and the results of the EIA of the site remediation NESHAP.

- Section 2 presents an overview of the site remediation source category and the estimated engineering control costs.
- Section 3 describes the EIA methodology and reports economic impact results. This section also includes qualifications of the analysis.

SECTION 2

AFFECTED INDUSTRIES AND ENGINEERING COSTS

Section 2 describes the remediation activities affected by the rule and the methods used by the Agency to identify potentially affected industries and calculate engineering compliance cost estimates. The broad nature of the rule results in a large number of potentially affected industries. Because of the difficulty in predicting which industries and companies will actually be affected by the rule when it is implemented, the Agency considers the results to provide an indication of the types of industries that will be affected and the possible distribution of impacts. The economic analysis, which is based on the data described in this section, provides a similarly general overview of the possible distribution of costs with a qualitative discussion of likely market impacts.

2.1 Characterizing the Remediation Activities Affected by the Rule[1]

A site remediation is performed in response to the release of hazardous substances into the environment (e.g., soil, groundwater, or other environmental media). It involves taking appropriate action to remove, store, treat, and/or dispose of the hazardous substances to the extent necessary to protect human health and the environment. The term "cleanup" generally refers to the activities performed to address the hazardous substance contamination. This term frequently is used interchangeably with the term "remediation."

Site remediations can be performed to address hazardous substance contamination resulting from either past or current human activities. Examples of such activities include accidental releases of chemical substances; undetected leaks in tanks or pipelines; releases from the use of incorrectly designed or poorly maintained equipment for managing materials containing hazardous substances; improper disposal of hazardous substances in surface impoundments, containers, waste piles, or landfills; and abandoned hazardous substances.

For the purpose of implementing the rule, a site remediation is one or more activities or processes used to remove, destroy, degrade, transform, or immobilize organic HAP constituents in soils, sediments, groundwater, surface waters, or other types of solid or liquid environmental media as well as "pure" materials that are not mixed with environmental media. The rule would not apply to site remediations specifically excluded from applicability. The proposed rule would not apply to the following:

[1]This section is based on information in Nizich (2001).

- site remediation involving the cleanup of radioactive mixed waste managed in compliance with all applicable regulations under Atomic Energy Act and Nuclear Waste Policy Act authorities
- site remediations performed to clean up remediation material containing little or no organic HAPs; the proposed rule would not apply to any facility for which the owner or operator demonstrates that the total annual organic HAP mass content of the remediation material to be cleaned up at the facility site is less than 1 megagram per year (Mg/yr)
- Superfund NPL sites and permitted or federal order RCRA corrective action cleanups are exempted from the rule.

2.2 Potentially Affected Industries

The proposed NESHAP would affect owners and operators of facilities, subject to the exceptions described in Section 2.1, that are major sources of HAP emissions and at which a site remediation is conducted to clean up media or other material contaminated with any of the organic HAP substances listed in the rule. Because of the nature of activities regulated by the source category, a comprehensive list of SIC or North American Industry Classification System (NAICS) codes cannot be compiled for businesses or facilities potentially regulated by this action. The rule may be applicable to any type of business or facility at which a site remediation is conducted to clean up media contaminated with organic HAPs and other hazardous material. For many businesses and facilities subject to the rule, the regulated sources (i.e., the site remediation activities) are not the predominant activity, process, operation, or service conducted at the facility. The Agency is aware of site remediation activities potentially subject to the rule being performed at facilities listed under SIC codes for petroleum refining, organic chemical manufacturing, refuse systems, waste management, business services, miscellaneous services, and nonclassifiable. Therefore, the industrial code alone for a given facility does not determine whether the facility is or is not potentially subject to this rule (Nizich, 2001).

For the economic impact analysis, the Agency identified a sample of industries that might be affected by the regulation using the best available data: the 1997 BRS database. The remainder of Section 2.2 describes the BRS database and the limitations of using these data to identify potentially affected industries.

2.2.1 The BRS Data

EPA, in partnership with the states, collects information biennially regarding the generation, management, and final disposition of hazardous wastes regulated under RCRA, as amended. The purpose of *The National Biennial RCRA Hazardous Waste Report (Based on 1997 Data)* is to communicate the findings of EPA's 1997 BRS data collection efforts to the public, government agencies, and the regulated community (EPA, 1999a). The report provides

- an overview of national hazardous waste generation and management practices;
- data on waste-handling practices in the EPA regions, states, and largest facilities nationally, including the quantity of waste generated, managed, shipped and received, and imported and exported between states and the number of generators and managing facilities;
- data on each state's waste handling practices, including overall totals for generation, management, and shipments and receipts, as well as totals for the largest 50 facilities;
- a list of large quantity generators that identifies every hazardous waste generator in the United States that reported itself to be a large quantity generator in 1997; and
- a list of treatment, storage, and disposal facilities that identifies every hazardous waste manager in the United States that reported itself to be a treatment, storage, or disposal facility in 1997.

The BRS database provides information on the facility name, location, quantity of waste generated by waste treatment category, SIC code, and other useful information. To generate estimates of the annual control cost for facilities, it is necessary to have information on the quantity of waste generated at the facility level, and the BRS is the best source of such information.

2.2.2 The Limitations of the BRS Database

Using the 1997 BRS data to identify the affected industries raises a number of issues. Most, if not all, of the remediation projects underway in 1997 will be completed by the year in which the rule takes effect. Thus, the specific companies identified in the 1997 BRS database may or may not incur compliance costs when the rule is implemented. In addition, the BRS data do not include the activities of off-site waste treatment facilities, which will be subject to the rule. However, the Agency anticipates that the off-site treatment facilities that would be subject to the rule will already have the necessary control equipment as a result of complying with other EPA rules. In addition, the quantity of shipped remediation waste for off-site treatment is typically only a small percentage of the total quantity of remediation waste generated (e.g., < 6 percent in 1997). Thus, the Agency believes this rule should impose minimal costs on off-site waste treatment firms. Furthermore, the BRS data identify only large quantity generators, which may exclude many other waste generators.[2] To the extent that large quantity generators are large

[2]Facilities must report their activities involving RCRA hazardous waste to BRS if they are either a RCRA-defined LQG or a TSD facility.

Large Quantity Generator: A generator is defined as a federal LQG if it meets any of the following criteria during the year: [a] the facility generated in one or more months 1,000 kg (2,200 lbs) or more of RCRA hazardous waste; or [b] the facility generated in one or more months, or accumulated at any time, 1 kg (2.2 lbs) of RCRA acute hazardous waste; or [c] the facility generated or accumulated at any time more than 100

companies, small businesses may not be adequately represented in this database. Furthermore, the BRS database does not identify which facilities are major sources of HAPs, so it is possible that some of the firms in the BRS that generate waste are not major sources of HAPs and thus would not be subject to the rule. In addition, the database would not include information on firms that are major sources of HAPs but generate small quantities of waste. These firms may still be required to comply with the rule but would not be identified in the BRS data.

Despite these limitations, the Agency believes the BRS data provide the best coverage of potentially affected firms to conduct the economic impact analysis. As stated above, providing a comprehensive list of affected industries is difficult because of the broad nature of the rule. The National Toxics Inventory (NTI) is a database that can be used to identify major sources of HAP emissions, but it does not contain the information on site remediation activities necessary to calculate control costs. The Agency was unable to match the BRS data with the data on major sources in the NTI. Therefore, it was determined that the BRS database provides the best indication of the industries that might be affected by the rule.

2.3 Control Technologies and Compliance Cost Estimates[3]

The Agency calculated estimated compliance costs for the 490 potentially affected industries. Below, we briefly describe the control technologies identified in the rule and the method used to calculate the compliance costs.

2.3.1 Control Technologies

The proposed rule defines three groups of affected sources: process vents, remediation material management units, and equipment leaks. The affected source for process vents is the entire group of process vents associated with both in situ and ex situ remediation activities. The affected source for remediation material management units is the entire group of tanks, surface impoundments, containers, oil/water separators, and transfer systems used to store, transfer, treat, or otherwise manage remediation material. The affected source for equipment leaks is the

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kg (220 lbs) of spill cleanup material contaminated with RCRA acute hazardous waste. The wastes that are not to be counted in determining whether a site is a LQG include: (i) RCRA hazardous wastes managed in systems regulated under the Clean Water Act (i.e., wastewater treatment plants) or the Safe Drinking Water Act (i.e., underground injection wells), (ii) wastes that are recycled or reclaimed, and (iii) wastes regulated only by a given state and not by RCRA.

Treatment, Storage, and Disposal Facility: This is a facility that treats, stores, or disposes of hazardous waste. Treatment is any method, technique, or process designed to (1) change the physical, chemical, or biological character or composition of any hazardous waste to neutralize such waste; (2) recover energy or material resources from the waste; or (3) render such waste nonhazardous or less hazardous. Storage is the temporary holding of hazardous waste until it is treated, disposed of, or stored elsewhere. Storage methods include use of containers, tanks, and surface impoundments. Disposal is the discharge, deposit, injection, dumping, spilling, leaking, or placing of waste so that it may enter the environment (air, land, or water).

[3]This section draws from Nizich (2001) and Zerbonia (2001).

entire group of remediation equipment components (e.g., pumps, valves) that contain or contact remediation material having a total organic HAP concentration equal to or greater than 10 percent by weight and are intended to operate for 300 hours or more during a calendar year.

Given the unique nature of the site remediation source category, the extent of information currently available to the Agency, and the complexities of gathering additional meaningful information, we decided to forgo statistically computing an emission limitation or identifying a specific control technology that represents the MACT floor for site remediations. The MACT floor for existing affected sources is some level of air emission control beyond no controls. Because the provisions of Section 112 allow the Agency to select MACT for a source category that is more stringent than the MACT floor (provided that the control level selected is technically achievable and that we consider the cost of achieving the emissions reductions, any nonair quality health and environmental impacts, and energy requirements associated with the selected control level (CAA Section 112 (d) (2)), we chose to select the MACT technology directly.

To select a MACT technology from alternatives beyond the MACT floor for each affected source, we looked at the types of air emission controls required under national air standards for sources similar to those sources that potentially may be associated with site remediations. These air standards are NESHAP for other source categories, particularly the Off-Site Waste and Recovery Operations (OSWRO) NESHAP (EPA, 1994, as cited in Zerbonia [2001]) under 40 CFR 63 subpart DD, and the air standards for RCRA hazardous waste treatment, disposal, and recovery facilities under subparts AA, BB, and CC in 40 CFR parts 264 and 265. The control levels established by the emission limitation and work practices proposed in the rule that are being implemented at existing sources subject to these similar rules demonstrate that the control levels are technically achievable (Nizich, 2001).

2.3.2 Control Cost Estimates[4]

According to the nationwide emission and control cost estimates memorandum (Zerbonia, 2001), in estimating nationwide HAP emissions from site remediation sources, the 1997 BRS database was used to estimate the quantity of remediation wastes generated by various regulatory categories (e.g., underground storage tanks), the physical form of the remediation wastes generated (e.g., inorganic liquids, organic solids, or organic sludges), and the quantities and methods used to manage and treat the remediation wastes on-site (e.g., incineration, aqueous organic treatment, or stabilization). The 1997 BRS data were used to represent nationwide baseline conditions for site remediations activities. A comparison of the total quantity of remediation-derived wastes reported in the BRS database for the years 1993, 1995, and 1997 showed that the total quantity of remediation waste treated on-site for these years remained about the same, approximately 22 million tons (this estimate includes some operations that are exempt from the rule).

The estimation of control costs for site remediation activities was based on the methodology developed for the OSWRO NESHAP (EPA, 1994, as cited in Zerbonia [2001]). Using this methodology, overall control cost factors were developed to estimate the costs of applying controls to the various remediation waste management and treatment system units (e.g., tanks, air and steam strippers, and process vents) based on the model unit type used to characterize the remediation activity. Separate cost factors were developed for each of the different waste management model units based on the "form" of the waste stream. Waste form codes were assigned according to the waste description code reported for the waste stream. The total annual cost for the control requirement is $7.80 million.

2.3.3 Monitoring, Inspection, Recordkeeping, and Reporting Costs

According to the nationwide emission and control cost estimates memorandum (Zerbonia, 2001), the annual monitoring, inspections, recordkeeping, and reporting (MIRR) costs were calculated based on the number of site remediation emission sources or system types and the cost factors for MIRR source types, expressed as annual cost per emission source. The engineering analysis used data obtained from EPA's 1997 BRS database to characterize the number of emission sources within the remediation waste treatment category or system type that would be required to apply controls. The cost factors used were those developed for the OSWRO NESHAP; the methodology and derivation of the MIRR cost factors are discussed in Appendix E of the OSWRO NESHAP BID, September 8, 1994. The costs are based on use of the control technologies applicable to the various waste management and treatment system types. To estimate MIRR costs the Agency had to determine the type of on-site process systems used to

[4]$1997. EPA adjusted the $2000 estimates using a cost factor (0.9753) developed from the Chemical Engineering Composite Plant Cost Index.

manage or treat the wastes (i.e., treatment methods). This information was obtained from Section II, Box D of Form GM. The total annual cost for MIRR is $0.16 million.

2.3.4 Formatting Engineering Cost Estimates for Economic Analysis

The total quantity of waste managed[5] and total annual compliance costs were estimated for all the treatment categories (see Tables 6a and 7a of the control cost estimates memorandum [Zerbonia, 2001]). Using this information, the Agency calculated the average annual control cost per ton of waste managed in each treatment category. The BRS database lists the quantity of waste generated by facility by treatment category. Multiplying the average control cost for each treatment category by the number of tons of waste managed by a facility for each treatment category and summing over all the treatment categories for each facility yields an estimate of the annual compliance cost for the facility. Aggregating the estimated facility compliance costs over SIC codes produces an estimate of the annual compliance cost for each SIC code in the BRS data. The annual control cost estimates by SIC code are only approximations based on average costs for each waste stream as calculated by the Agency. However, they should provide a basis for a general assessment of the impact of the proposed regulation.

2.4 Summary of Estimated Control Costs for Potentially Affected Industries

Using the BRS database, of the 490 industries (by SIC) potentially affected by the rule, four SIC codes generated more than 500 waste streams per code, 28 SIC codes generated more than 100 waste streams per code, 48 SIC codes generated more than 50 waste streams per code, 84 SIC codes generated more than 25 waste streams per code, and 190 SIC codes generated 10 or more waste streams per code. Major industry sectors that are engaged in site remediation activities include industrial organic chemical manufacturing, petroleum refining, waste management (refuse), plating and polishing, aircraft, and semiconductors to list a few.

Using the methodology described above, the Agency estimates approximately 16 percent of the 490 potentially affected industries identified in the 1997 BRS database might have faced additional control costs associated with HAP and VOC emission reductions if the proposed MACT standards had been implemented in 1997. According to the nationwide emission and control cost estimates memorandum (Zerbonia, 2001), total control costs for this rule are estimated to be $7.96 million[6]. Table 2-1 presents the total compliance costs for the top 15 industries potentially affected by the rule. These industries account for 91 percent of the total national compliance cost estimate (see Figure 2-1).

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[5]Wastes not potentially affected by the MACT applicability (i.e., CERCLA and RCRA Corrective Action sites with source codes of A61, A62, and A63) were not included in the analysis.

[6]$1997. EPA adjusted the $2000 estimates using a cost factor (0.9753) developed from the Chemical Engineering Composite Plant Cost Index.

Table 2-1. Total Annual Control Costs (TACC) for Site Remediation MACT by Industry: 1997 BRS Data Set

SIC Code	Description	Total Annual Control Costs[a]	Share of TACC
3351	Copper rolling and drawing	$1,454,760	18%
2819	Industrial inorganic chemicals, n.e.c.	$1,164,347	15%
9999	Unclassifiable establishments	$1,055,556	13%
2869	Industrial organic chemicals, n.e.c.	$893,113	11%
3354	Aluminum extruded products	$559,896	7%
2491	Wood preserving	$465,774	6%
3728	Aircrat parts and equipment, n.e.c.	$393,920	5%
3334	Primary aluminum	$288,344	4%
2816	Inorganic pigments	$275,047	3%
3861	Photographic equipment and supplies	$194,294	2%
	Unknown	$128,052	2%
9224	Fire Protection	$116,520	1%
4953	Refuse systems	$113,032	1%
3795	Tanks and tank components	$83,487	1%
5171	Petroleum bulk stations and terminals	$67,051	1%
	Subtotal	$7,243,193	91%
	Other	$716,356	9%
	Total	$7,959,549	100%

[a] $1997. EPA adjusted the $2000 estimates using a cost factor (0.9753) developed from the Chemical Engineering Composite Plant Cost Index. Note these cost also include in situ.

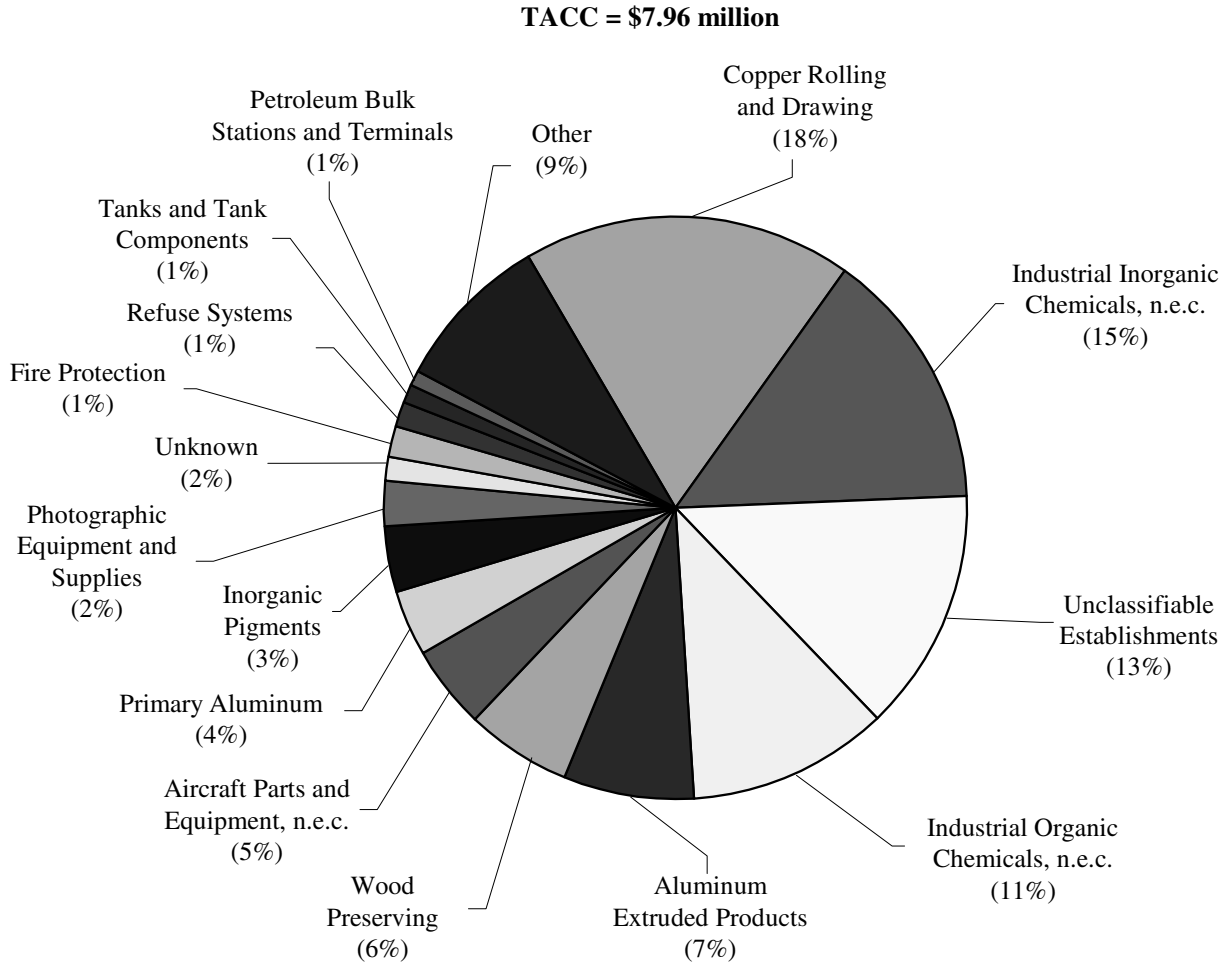

Figure 2-1. Distribution of Total Annual Compliance Costs by Industry ($1997)

SECTION 3

ECONOMIC IMPACT ANALYSIS: METHODS AND RESULTS

The underlying objective of the economic impact analysis is to evaluate the effect of the proposed regulation on the welfare of affected stakeholders and society in general. The proposed rules to control air pollution sources from site remediation activities will affect a wide variety of industries. Implementation of the proposed rules will increase the costs of production at affected facilities. The response of producers to the additional production costs associated with rule compliance and the response of consumers to changed market conditions determine the economic impact of the regulation. Specifically, the increased costs of production associated with the rule may induce affected owners to change production processes, inputs, or output rates or to cease operations. If the remediation is not required, the increased costs associated with the rule may alter the firm's decision about whether or not to remediate. These actions have broader societal implications because they are transmitted through market relationships such as price and output to producers and consumers.

EPA typically develops partial equilibrium computational models to measure the size and distribution of economic impacts associated with air pollution regulations. These models account for behavioral responses by producers and consumers to the regulation (i.e., reactions by producers and consumers result in changes in prices and production levels). Many attempts were made to collect data in the format needed for such an analysis. After critical review, however, the Agency concluded that the data were insufficient to develop a market model. As a result, the Agency developed a qualitative description of potential market impacts of the rule and conducted a simple screening analysis, described in more detail below, to develop quantitative measures of the economic impacts associated with the rule.

3.1 Qualitative Discussion of Economic Impacts on Firms and Consumers

The proposed rule will potentially change the decisions made by firms regarding the remediation of contaminated media (e.g., soil or ground water) and ultimately could influence decisions regarding their primary production operations. As a result of changes in the cost of production at the firm level, supply and demand for services will directly impact the affected industry and may indirectly impact other industries. Below we describe the possible actions for firms that will have sites they need to remediate at the time the rule is implemented and the decision firms face about the generation and clean up of future contaminated media. We discuss the possible impacts on market supply and demand for the final products in the affected industry

and indirect impacts on other industries. Finally, we summarize the possible impacts on consumers and social welfare.

3.1.1 Firm-Level Decisions

In baseline, firms choose a mix of products, level of production, and method of production. The production process generates materials and residual wastes that can contaminate the local media at the site, both anticipated and accidental, that must be remediated either on-site or off-site. Firms that remediate on-site can choose between one or more on-site treatment methods and purchasing remediation services from off-site providers. Off-site waste handlers will also choose between one or more treatment methods to handle the flow of waste they receive from site remediation projects and other sources. Given these choices, firms will attempt to minimize costs of complying with new regulations.

3.1.1.1 Remediation Resulting from Past Production Decisions

Depending on the choices firms have made in the past, there may be contaminated media that must be remediated when the proposed rule is implemented. These firms face a choice of remediating the waste or materials on-site or shipping off-site to a third-party remediator. The rule will potentially affect the costs of both alternatives. Firms that decide to remediate waste materials from site remediation projects on-site will face increased costs for remediation due to the rule. The rule may also change the relative cost of different remediation alternatives, leading the firm to change the way it treats remediation waste materials. In either case, the cost of on-site remediation will increase, causing an increase in the cost of producing the final goods supplied by that firm.

Alternatively, the firm could decide to send its remediation waste materials off-site for treatment. As discussed in Section 2, the Agency assumes that the off-site waste treatment firms have already installed the required control technology, so the proposed rule should not impose additional costs on off-site waste treatment facilities. However, if demand for off-site waste treatment increases as a result of the rule, then the cost of off-site remediation may increase. Figure 3-1 shows the upward-sloping supply curve for off-site remediation services, S^{off}, and a baseline demand curve, D. Assuming that the off-site remediation industry is perfectly competitive, an increase in demand to D′ will result in an increase in the price of off-site remediation services from P^{off} to $P^{off'}$.

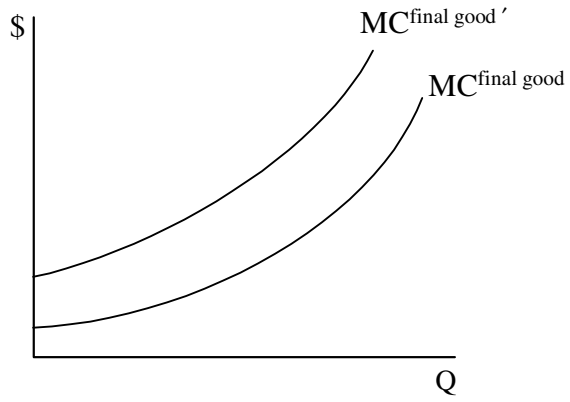

Figure 3-1. Marginal Cost Curve for Final Market Good

Regardless of whether the site remediation waste material is treated on-site or off-site, the cost of remediation may increase, leading to an increase in the cost of producing the final market goods supplied by the firm. In Figure 3-2 the marginal cost curve for producing the final market good for a firm in a perfectly competitive industry will shift upwards from $MC^{final\ good}$ to $MC^{final\ good'}$ indicating an increase in the marginal cost of producing a unit of the final market good.

The following firm decision rule summarizes the options the firm faces:

$$\min\left[C(p^{off}); C(b^{on}, c^{on})\right]$$

where $C(p^{off})$ is the cost of off-site remediation given the price of remediation services. $C(b^{on},c^{on})$ is the total cost of on-site remediation, which is equal to the baseline cost of on-site remediation (b^{on}) and the additional cost associated with the rule (c^{on}). The firm will choose the treatment strategy that minimizes the cost of treating site remediation waste given the additional costs imposed by the rule directly on firms that remediate on-site and indirectly through an increase in the demand for off-site treatment services for firms that send their waste off-site for treatment.

3.1.1.2 Remediation Resulting from Future Production Decisions

The proposed rule may also influence future production decisions that affect the generation of wastes that could contaminate local media and ultimately need remediation. In this context, firms have more options than when they are facing the choice of how to clean up existing contaminated media. In addition to the choice between on-site and off-site management of remediation materials, looking to the future firms may choose to

- change output levels to reduce the amount of waste generated or the likelihood of an accidental release of hazardous waste,
- change the mix of outputs to produce products that generate less waste or reduce the likelihood of an accidental release of waste,
- change production processes or the mix of inputs to reduce the amount of waste generated or reduce the likelihood of an accidental release of waste, or
- cease operations if total revenues are less than total costs (production costs plus remediation costs).

3.1.2 A Qualitative Analysis of Market Impacts

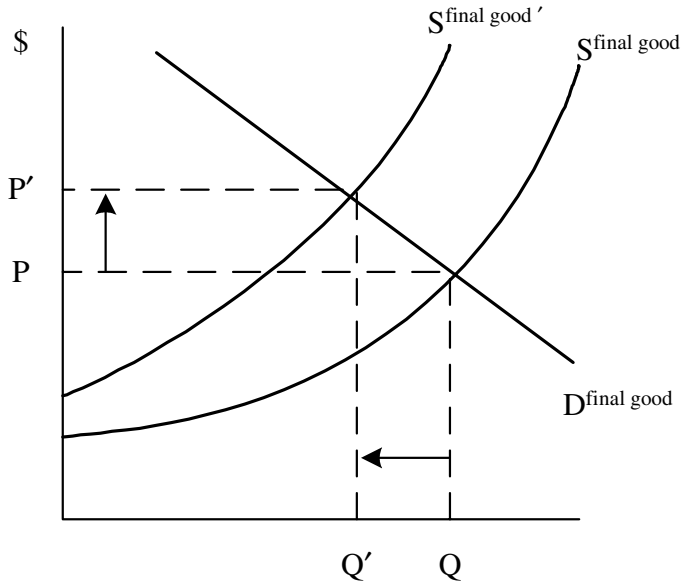

Figure 3-3. Market Equilibrium Without and With Regulation

The Agency qualitatively evaluated the potential market impacts of the rule using the model of perfect competition. In these markets, buyers and sellers exert no individual influence on market prices. Price is set by the collective actions of producers and consumers of products and services who take the market price as a given in making their production and consumption choices. Figure 3-3 illustrates a market in which prices and quantities for final goods are determined by the intersection of market supply and demand curves. The baseline consists of a market price and quantity (P, Q) that is determined by the downward-sloping market demand curve ($D^{final\ goods}$) and the upward-sloping market supply curve ($S^{final\ goods}$).

Incorporating these regulatory control costs results in an upward shift (from $S^{final\ goods}$ to $S^{final\ goods'}$) of the aggregate supply curve. At the new equilibrium with the regulation, the market

price increases from P to P′ and market output declines from Q to Q′. In the long run, if the firms decide to change the mix of inputs or outputs produced as a result of the regulation, this will further affect market prices and quantities. To the extent that firms are able to adapt their processes to reduce the need for site remediation or to reduce the cost of treating the waste from site remediation, the long-run costs of the rule may be lower.

3.1.3 Impact on Consumers and Social Welfare

The analytics above suggest we could expect upward pressure on prices in industries that need site remediation services, so prices will be directly or indirectly affected by the proposed regulation as producers make new choices. Among other things, the magnitude of these price changes would depend on

- the size of the unit control costs relative to market price,
- the elasticity of consumer demand for the products,
- the elasticity of supply by the producers, and
- the number of affected firms and their share of the market.

Higher production costs and increases in price reduce quantity demanded by consumers and output by firms for each product, leading to changes in economic welfare of consumers and the profitability of firms. These market adjustments would determine the social costs of the regulation and its distribution across stakeholders (producers and consumers). Without more detailed data and analysis, predicting the magnitude of the social costs of the regulation is difficult.

3.2 Selection of Industries for the Economic Impact Analysis

As discussed in Section 2, the Agency identified over 490 industries (SIC codes) that would potentially have been affected by the rule using the 1997 BRS database. Out of this 490, over 80 industries were identified that might have faced additional control costs if the proposed MACT standards had been implemented in 1997. The data requirements for collecting data on each of these industry's activities (i.e., company financial data for each affected company within the industry and market data for each affected industry) are substantive given the large number of potentially affected industries. Therefore, the Agency employed the following strategy to select a limited number of industries for the economic analysis. First, the Agency aggregated the facility-level costs by SIC code to compute the total costs of the rule for each affected SIC code (presented in Table 2-1). The cost estimates do not include Superfund NPL sites and permitted or federal order RCRA corrective action cleanups that are exempted from the rule. Out of this list, EPA identified the 15 industries with the highest total annual compliance cost estimates. These 15 industries, listed in Table 3-1, account for approximately 91 percent of the total

national compliance cost estimate ($7.24 million). Given the uncertainty about which firms would be impacted and because the BRS data is reported using the SIC system and the bridges between the SIC and NAICS code classifications were not one-to-one for all industries, EPA determined the most appropriate way to analyze the industry data was using the SIC system. Table 3-2 lists the NAICS codes associated with the 15 SIC codes analyzed that would potentially be impacted by the rule.

3.3 Economic Impact Methodology and Results

The Agency employed an engineering or financial analysis to estimate impacts, which takes the form of the ratio of compliance costs to the value of sales (cost-to-sales ratio or CSR). The analysis assesses the burden of the rule by assuming the affected firms fully absorb the control costs, rather than passing them on to consumers in the form of higher prices. One drawback for this approach is that it does not consider interaction between producers and consumers in a market context (i.e., the interaction between change in price and change in quantity demanded and supplied). Therefore, it likely overstates the impacts on facilities and firms affected by the rule and understates the impacts on consumers. EPA calculated a CSR for each of the 15 industries as follows:

$$\text{CSR} = \text{Total Annual Compliance Costs/Values of Shipments or Receipts} \qquad (3.1)$$

To compute these ratios, EPA attempted to collect basic economic information for all 15 industries identified in Section 3.2 using the U.S. Census Bureau's "Comparative Statistics 1987 SIC Basis" (U.S. Census Bureau, 2001) (see Table 3-1). However, 1997 data were available for only 8 of the 15 industries (53 percent). The Agency obtained 1992 revenue statistics for four of the remaining seven industries missing data (U.S. Census Bureau, 1995a-d). For the screening analysis, 1992 data were adjusted to 1997 dollars using a GDP deflator. As shown in Table 3-3, shipments for the 12 industries ranged from $4 to $182 billion.

The CSR analysis results do not show significant impacts for any industry. All of the ratios are less than 0.02 percent. A review of profitability measures (Dun & Bradstreet, 1997) shows that these values are significantly below return-on-sales (ROS) data for even the lower quartiles of industries with data available. The lowest lower quartile ROS measure was 0.4 percent (petroleum bulk stations and terminals).

The CSR should be interpreted with care. Again, we emphasize that this approach does not account for the fact that the regulation may cause the economic conditions to change. The CSR approach assumes that firms continue to produce the same quantity of output using the same inputs, production process, and remediation method. In addition, the firms are assumed to absorb all costs. This approach essentially holds fixed all interaction between facility production and market forces. In reality, some percentage of the control costs may be passed along to other

parties through various economic exchanges. Therefore, it is likely that the CSR overstates the impacts on industries and understates the impacts on consumers.

3.4 Small Business Impacts

Small business impacts were particularly difficult to assess. As discussed in the Preamble, this rule sets minimum standards to be met when parties engage in future site remediation activities, but it does not itself require any party to undertake such activities. States may choose to direct a party to undertake site remediation, or parties may undertake remediation activities voluntarily. EPA anticipates that parties that undertake site remediation generally will do so voluntarily and that the impact of this rule on those parties will not be significant. Further, because States and other parties will decide whether to undertake site remediation activities, it is extremely difficult, if not impossible, to predict how many or what types of small entities will undertake such activities. The rule is structured to avoid impacts on small businesses. The rule specifically excludes from its scope remediations conducted at gasoline stations, farm sites and residential sites (on the ground that these remediations would not exceed the threshold for major sources). Moreover, the rule would apply only to remediation sites

Table 3-1. Economic Data for 15 Industries with Highest Total Annual Control Costs (TACC)

SIC Code	Description	Establishments	Value of Shipments (10^3)	Paid Employees	Annual Payroll (10^3)
2491	Wood Preserving	451	$4,461,521	11,668	$298,123
2816	Inorganic Pigments	74	$3,734,497	8,608	$395,570
2819	Industrial Inorganic Chemicals, NEC	667	D	D	D
2869	Industrial Organic Chemicals, NEC	740	D	D	D
3334	Primary Aluminum	21	$6,224,610	15,763	$707,402
3351	Copper Rolling and Drawing	129	$7,679,080	21,150	$786,621
3354	Aluminum Extruded Products	160	$6,177,701	30,357	$944,829
3728	Aircraft Parts and Equipment, NEC	1,138	$20,073,061	127,729	$5,747,346
3795	Tanks and Tank Components	37	D	D	D
3861	Photographic Equipment and Supplies	739	$21,305,761	63,642	$2,928,089
4953	Refuse Systems	NR	NR	NR	NR
5171	Petroleum Bulk Stations and Terminals	9,104	$181,554,365	116,215	$3,524,999
9224	Fire Protection	NR	NR	NR	NR
9999	Unclassifiable Establishments	NA	NA	NA	NA
	Unknown	NA	NA	NA	NA

D = Withheld to avoid disclosure.
NA = Not available.
NR = Not reported.
Source: U.S. Bureau of the Census. "Comparative Statistics 1987 SIC Basis." <http://www.census.gov/epcd/ec97sic/>. As obtained on December 20, 2001.

Table 3-2. SIC and NAICS Codes for 15 Industries with Highest Total Annual Control Costs

SIC Code	Description	NAICS	NAICS Description
2491	Wood preserving	321114	Wood preservation
2816	Inorganic pigments	325131	Inorganic Dye and Pigment Manufacturing (pt)
		325182	Carbon Black Manufacturing (pt)
2819	Industrial inorganic chemicals, n.e.c.	211112	Natural gas liquid extraction
		325131	Inorganic dye and pigment mfg
		325188	All other basic inorganic chemical mfg
		325998	All other miscellaneous chemical product and preparation mfg
		331311	Alumina refining
2869	Industrial organic chemicals, n.e.c.	325110	Petrochemical Manufacturing (pt)
		325188	All other basic inorganic chemical mfg (pt)
		325193	Ethyl alcohol mfg
		325120	Industrial gas mfg (pt)
		325199	All other basic organic chemical mfg (pt)
3334	Primary aluminum	331312	Primary aluminum production
3351	Copper rolling and drawing	331421	Copper rolling, drawing, and extruding
3354	Aluminum extruded products	331316	Aluminum extruded product mfg
3728	Aircraft parts and equipment, n.e.c.	336413	Other aircraft part and auxiliary equipment mfg
3795	Tanks and tank components	336992	Military armored vehicle, tank, and tank component mfg (pt)

(continued)

Table 3-2. SIC and nNAICS Codes for 15 Industries with Highest Total Annual Control Costs (continued)

SIC Code	Description	NAICS	NAICS Description
3861	Photographic equipment and supplies	325992	Photographic film, paper, plate, and chemical mfg
		333315	Photographic and photocopying equipment mfg (pt)
4953	Refuse Systems	562211	Hazardous waste treatment and disposal
		562212	Solid waste landfill
		562213	Solid waste combustors and incinerators
		562219	Other nonhazardous waste treatment and disposal
		562920	Materials recovery facility
5171	Petroleum bulk stations and terminals	422710	Petroleum bulk stations and terminals
		454311	Heating oil dealers (selling for consumption—retail)
		454312	Liquefied petroleum dealers (selling for consumption—retail)
9224	Fire Protection	92216	Fire Protection
9999	Unclassifiable Establishments		NA
	Unknown		NA

Table 3-3. Economic Impact Screening Analysis

SIC Code	Description	Value of Shipments (10^3)	Total Annual Compliance Costs (10^3)	Cost-to-Sales Ratio	Lower Quartile." Return on Sales
2491	Wood Preserving	$4,461,521	$418	0.009%	0.6%
2816	Inorganic Pigments	$3,724,497	$258	0.007%	NA
2819	Industrial Inorganic Chemicals, NEC	$20,169,205	$1,158	0.006%	0.9%
2869	Industrial Organic Chemicals, NEC	$60,226,652	$737	0.001%	1.2%
3334	Primary Aluminum	$6,224,610	$367	0.006%	NA
3351	Copper Rolling and Drawing	$7,679,080	$1,306	0.017%	NA
3354	Aluminum Extruded Products	$6,177,701	$551	0.009%	1.8%
3728	Aircraft Parts and Equipment, NEC	$20,073,061	$259	0.001%	1.3%
3795	Tanks and Tank Components	$22,586,854	$80	0.000%	NA
3861	Photographic Equipment and Supplies	$21,305,761	$175	0.001%	0.7%
4953	Refuse Systems	$15,654,017	$104	0.001%	0.5%
5171	Petroleum Bulk Stations and Terminals	$181,554,365	$60	0.000%	0.4%
9224	Fire Protection	NR	$115	NA	NA
9999	Unclassifiable Establishments	NA	$891	NA	NA
	Unknown	NA	$111	NA	NA

NA = Not available.
NR = Not reported.

Source: U.S. Bureau of the Census. "Comparative Statistics 1987 SIC Basis." <http://www.census.gov/epcd/ec97sic/>. As obtained on December 20, 2001.
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located at a facility that is a major source under the Clean Air Act and engages in a "MACT activity" (defined as a non-remediation activity covered in the MACT list of major source categories pursuant to CAA section 112 (c)). Such sources tend to be large businesses. The rule also contains emission thresholds that are not likely to apply to small businesses. For example, the rule exempts sources where the total annual quantity of HAP contained in all extracted remediation material at the facility is less than 1 Mg per year. For these reasons, EPA certifies that the rule, if promulgated, will not impose a significant economic impact on a substantial number of small entities.

3.5 Conclusions and Qualifications

3.5.1 Conclusions

The economic impact analyses focused on a set of industries that were known to be large quantity generators of hazardous waste who were generating hazardous and non-hazardous waste as part of a site remediation in 1997 as reported in the BRS database. The Agency believes that the data provide an overview of the potential impacts of the rule. However the Agency recognizes that the set of industries identified in the data will probably not be the exact industries that will be directly affected by the rule in the year the rule is implemented. As stated in Section 3.4, the Agency anticipates that parties that undertake site remediation generally will do so voluntarily and that the impact of this rule on those parties will not be significant.

3.5.2 Qualifications

In addition to qualifications mentioned elsewhere in the report, the results and assessments of the screening analysis should be viewed in light of the following limitations and uncertainties:

- EPA used the 1997 BRS database to identify future remediation sites. The actual firms and industries affected by the rule may differ from this population.
- The 1997 categories of waste treatment options in the BRS may change and/or the distribution of wastes within each category may change for future remediation sites.
- The engineering cost estimates represent an upper-bound estimate for the firm's costs. There may be lower cost alternatives that achieve the same emission reductions.
- Superfund NPL sites and permitted or federal order RCRA corrective action cleanups are exempted from the rule.

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15. SUPPLEMENTARY NOTES

16. ABSTRACT

The final rule would implement Section 112(d) of the CAA by requiring those affected site remediation activities to meet emission limitation, operating limit, and work practice standards reflecting the application of the maximum achievable control technology (MACT). The economic impact analyses focused on a set of industries that were known to be large quantity generators of hazardous waste who were generating hazardous and non-hazardous waste as part of a site remediation in 1997 as reported in the BRS database. The Agency believes that the data provide an overview of the potential impacts of the rule. The Agency employed an engineering or financial analysis that takes the form of estimating impacts through the ratio of compliance costs to the value of sales (cost-to-sales ratio or CSR) using total industry revenues, control costs, and accounting measures of profit.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
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