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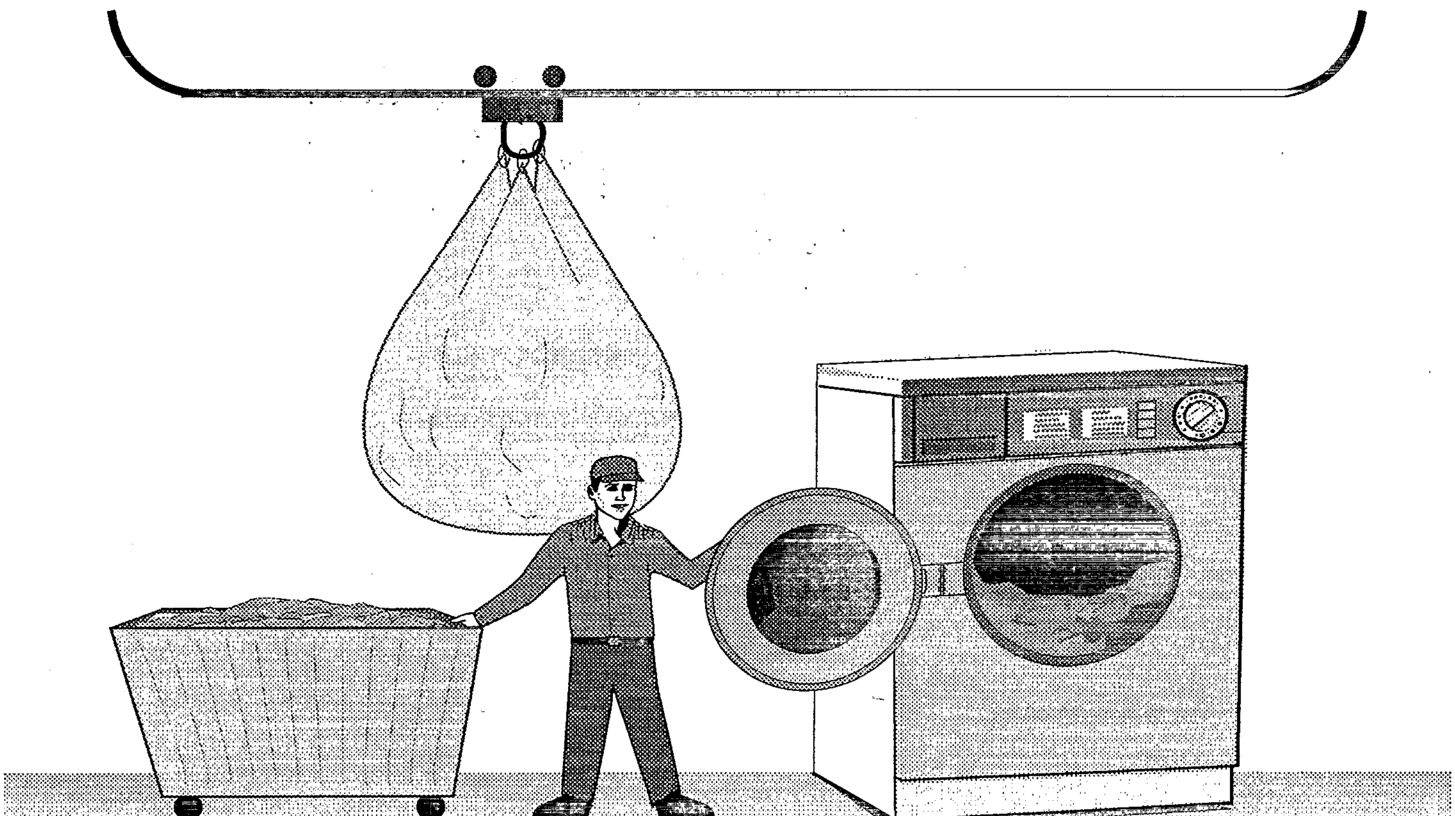
Economic Assessment for Proposed Pretreatment Standards for Existing and New Sources for the Industrial Laundries Point Source Category



ECONOMIC ASSESSMENT FOR PROPOSED PRETREATMENT STANDARDS FOR EXISTING AND NEW SOURCES FOR THE INDUSTRIAL LAUNDRIES POINT SOURCE CATEGORY

FINAL REPORT

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SECTION ONE

EXECUTIVE SUMMARY

1.1 INTRODUCTION

This Economic Assessment (EA) report evaluates the economic impacts resulting from pretreatment standards proposed by the U.S. Environmental Protection Agency (EPA) for the industrial laundries point source category (hereinafter, the IL Standards). The EA is organized into ten sections:

- Section Two presents the major sources of data used in analyzing the proposed rulemaking
- Section Three presents a profile of the industry
- Section Four presents an estimate of the annual aggregate cost for industrial laundry facilities to comply with the rule using facility-level capital and operating and maintenance (O&M) costs
- Section Five evaluates, using a financial model, compliance cost impacts on facilities' cash flow (closure analysis)
- Section Six evaluates, using a financial model, compliance cost impacts on the financial health of firms in the industry (firm failure analysis) and also presents an assessment of the potential for impact on new sources (barrier to entry)
- Section Seven presents an assessment of impacts from the proposed rule on output and employment, both nationally and regionally
- Section Eight discusses impacts on employment, markets, establishments other than industrial laundries that might provide some industrial laundry services, inflation, distribution, environmental justice, and industrial laundry customers
- Section Nine presents an analysis of the effects of compliance costs on small entities pursuant to the Regulatory Flexibility Act (RFA) as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA)
- Section Ten is a cost-benefit analysis pursuant to Executive Order 12866 and the Unfunded Mandates Reform Act (UMRA).

Summaries of each of these sections are presented below in Sections 1.2 through 1.10. Table 1-1 presents a summary of all costs, impacts, and benefits, by option.

Table 1-1. Summary of Costs, Impacts, and Benefits, by Option (1993$)

Option	Annualized Cost ($ million, 1993)	No. of Facility Closures	No. of Firm Failures	Net Direct Employment Losses	Other Secondary Impacts	Total Social Costs ($ million, 1993)	Total Benefits ($ million, 1993)
OC	$41.6	3	22	275	Negligible	$62.1	Negligible
CP	$85.0	33	65	470	Negligible	$126.1	$2.64-9.58
COMBO	$90.0	33	65	456	Negligible	$134.0	$2.64-9.56
DAF	$107.3	34	66	421	Negligible	$162.7	$2.64-9.56

Note: See Table 4-1 in Section Four of the EA for a detailed description of these options.

1.2 SOURCES OF DATA

This EA presents all costs in 1993 dollars. Any costs not originally in the base year (1993) dollars have been inflated or deflated to 1993 dollars using the Engineering News Record Construction Cost Index, unless otherwise noted in that report (see the EA for details). The primary source of data for the economic analysis is the *1994 Industrial Laundries Industry Detailed Questionnaire* (Section 308 Survey). Other sources include government data from the Bureau of the Census, industry trade journals, and several preliminary surveys of the industry, including the 1989 *Preliminary Data Summary for Industrial Laundries,* the *1993 Industrial Laundries Industry Screener Questionnaire*, the *1994 Industrial Laundries Supplemental Screener Questionnaire*, and EPA's Development Document for this rulemaking.

1.3 PROFILE OF THE INDUSTRY

The industrial laundries industry supplies clean uniforms and textiles to industrial, commercial, and government customers. Industrially laundered items enhance workplace cleanliness and promote safety, corporate identity, and company image. For the most part, industrial laundries own the goods they process and supply them to customers on a rental basis; however, some facilities also launder customer-owned uniforms and textiles, which the industry refers to as "Not Our Goods" (NOGs). Direct sales of products can also account for a small portion of industrial laundries' business. Uniform rentals account for the largest portion of industrial laundries' customer base and revenues. Other products rented include mats, mops, shop and print towels/rags, continuous roller towels, and linen. The full definition of an industrial laundry is provided in the Preamble to the rule.

In general, industrial laundries operate in local markets, although there are some "niche" laundries that specialize in handling particular items and that service customers over a relatively wide geographic area. Furthermore, while some localities are dominated by a single firm or handful of firms, the typical market for industrial laundering services appears to be quite competitive.

Based on Section 308 Survey data, EPA estimates that 1,747 facilities in the United States meet its definition of an industrial laundry. These facilities vary significantly with respect to the types and volume of items they clean, the amount of wastewater they generate, the number of people they employ, and the revenues they earn, among other characteristics. As a result, it is not possible to describe a "typical" industrial laundry. In general, however, facilities that handle less than 1 million pounds of textiles per year receive smaller profits and generate less wastewater than facilities that handle larger quantities of textiles. Baseline pollutant loadings from the smaller facilities, moreover, tend to be relatively minor, except in the case of facilities that handle shop towels or printer towels/rags, which can contain a relatively high concentration of toxic contaminants. Approximately 8 percent of the facilities that meet EPA's definition of an industrial laundry (141 out of 1,747) handle less than 1 million pounds of textiles and less than 255,000 pounds of shop towels and/or printer towels/rags per calendar year. As discussed in the Preamble, these facilities are excluded from the rule. All the excluded facilities are small entities under the Small Business Administration (SBA) definition of "small."

The 1,747 industrial laundry facilities are owned by an estimated 903 firms. A total of 830 of these firms (92 percent) are single-facility firms (i.e., firms associated with a single facility). The remaining 73 firms are multifacility firms (i.e., firms that own more than one facility). In general, multifacility firms are larger than single-facility firms and might service multiple localities. A total of 837 of the 903 firms (93 percent) earn less than $10.5 million in revenues per year and therefore are small firms according to SBA Guidelines. Most of these small businesses (812) are single-facility firms.

1.4 ANNUALIZED COSTS OF COMPLIANCE

Central to the EA is the cost annualization model, which uses facility-specific cost data and other inputs to determine the annualized capital and O&M costs of improved wastewater treatment. This model uses these costs (along with an annual compliance monitoring cost) with the industry-specific real cost of capital (discount rate) over a 16-year analytic time frame to generate the annual cost of compliance for the selected option, as well as the other options considered during the course of the proposal effort. EPA chose the 16-year time frame for analysis based on the depreciable life for equipment of this type, 15 years according to Internal Revenue Service (IRS) rules, plus time for purchasing and installing the equipment. As an alternative to installing wastewater treatment, facilities may choose, within many of the technology options considered, to have wastewater hauled offsite (a decision handled within the model, as discussed below). The model generates the annualized cost for each option (including the annual cost of hauling wastewater) for each facility in the survey, which is then used in the facility and firm analyses, discussed below in Section 1.5.

The cost estimates include zero costs for the subset of the industry that EPA has proposed to exclude from coverage by the regulation.

EPA investigated four options: Organics Control (OC), Chemical Precipitation (CP), Dissolved Air Flotation (DAF), and an option allowing facilities currently operating DAF systems to continue to operate their systems, with all other facilities meeting an option based on the CP technology (with limits set at the lower of the two sets of limits associated with the two types of technologies—the COMBO option). A fifth option using DAF limits for facilities currently using DAF systems and CP limits for all other facilities was also briefly investigated. Costs and impacts of this fifth option are about the same as those for COMBO, and this option is not discussed in detail in this report.

EPA estimates that the proposed rule will cost industry $85.0 million per year for the CP option. The OC option would cost $41.6 million; the COMBO option would cost $90.0 million; and the DAF option would cost $107.3 million.

1.5 FACILITY-LEVEL ANALYSIS

In the facility analysis, EPA models the economic impacts of regulatory costs on individual industrial laundry facilities, irrespective of ownership. In this part of the analysis, the model uses the annualized costs of each option, compares them to the alternative annual wastewater hauling costs (where this alternative is available), and selects the lowest of the two.

EPA then reduces this resulting cost to take into account that portion of compliance costs that can be passed through to customers. Compliance costs are adjusted downward by a factor (the cost pass-through factor, 32 percent) that is calculated using EPA's model of the industrial laundries market (see Appendix A). This model, which quantifies the price and quantity changes in the industrial laundries market due to the proposed rule, shows that the industry will be able to pass some portion of the compliance costs of the proposed rule through to their customers and calculates the percentage that can be passed through. The market model is a simultaneous equation for determining price and quantity using supply and demand curves for the industry that EPA developed based on data in the Section 308 Survey and U.S. Census Bureau economic data. Although EPA believes that assuming the industry cannot pass any costs through to customers is unrealistic, an analysis in the EA shows that a zero-cost passthrough assumption produces nearly identical closure analysis results (see Appendix D).

EPA then converts the adjusted annual cost for each facility into a present value change in cash flow, which is subtracted from the estimated baseline present value of facility cash flow. Estimated baseline present value of facility cash flow is based on the average of three years of financial data from each facility in the Section 308 survey under an assumed no-growth scenario (i.e., the annual cash flow, calculated as the 3-year average is expected to remain the same over the 16-year period of analysis). If the change in present value of cash flow (which is derived from the adjusted annualized costs of compliance) causes a facility's estimated cash flow to change from positive in the baseline to zero or negative after implementing the requirements of the proposed rule over the 16-year period of analysis, EPA considers the facility likely to close (i.e., liquidate) as a result of the regulation. This approach is somewhat different from methodologies used in other EAs and economic impact analysis for manufacturing industries, since salvage value is not considered in the closure analysis here. For a number of reasons, outlined in the EA (see Appendix C), EPA found that using salvage value in a closure analysis for this industry is not the best way for determining whether a facility would be liquidated. EPA found that baseline closures calculated using salvage value accounted for a large percentage (nearly 30 percent) of existing facilities. The industrial laundries industry, like many service industries, is a low-asset industry whose greatest "asset" (which is not accounted for on a balance sheet) is the customer base. A customer base is closely associated with an expected cash flow.

Note that facilities that reported negative cash flow over the 3-year period of the survey are considered baseline closures and are not considered affected by the rule for several reasons. First, many of these facilities (50 facilities that are not excluded from coverage by the IL Standards) are nonindependent facilities owned by multifacility firms. These facilities might be transferring production (laundering services at or near cost) from other facilities owned by the same parent company, or otherwise not expected to be self-supporting by the parent. EPA analyzes the owner firms of these facilities in the firm-level analysis and as long as the owner firm can afford to install and operate compliance equipment in these facilities, EPA assumes these facilities will close neither in the baseline nor postcompliance. Second, OMB guidance suggests that agencies develop a baseline that is "the best assessment of the way the world would look absent from the proposed regulation. That assessment may consider a wide range of factors, including the likely evolution of the market..." EPA's best assessment is that some facilities currently operating might not be around to install and operate the pollution control equipment. It is possible that a facility estimated to be a baseline closure might remain open, but the converse is also true—a facility projected to remain open until it is subject to the rule might actually close independently of the effects of the rule (both results might be equally possible). Thus, consistent with OMB guidance, EPA estimated postcompliance closures by counting closures that are projected to close solely due to the effect of the proposed rule.

EPA estimates that the proposed rule under the CP option would result in 33 facilities closing, or 2.1 percent of all facilities in the postcompliance analysis. The OC option is associated with 3 facility closures, while the COMBO option is associated with 33 facility closures. The DAF option is associated with 34 closures.

Another key analysis EPA performs is an analysis to determine impacts on new sources, which is primarily a "barriers-to-entry analysis" to determine whether the costs of the PSES would prevent a new source from entering the market. This analysis looks at whether new industrial laundries would be at a competitive disadvantage compared with existing sources. Market effects and barriers to entry associated with the small source exclusion also are qualitatively investigated.

EPA investigated all options considered under PSES as potential PSNS options. EPA selected the CP option for both sets of proposed standards.

EPA has found that overall impacts from the proposed IL Standards on new sources would not be any more severe than those on existing sources, since the costs faced by new sources generally will be the same as or less than those faced by existing sources. It is typically less expensive to incorporate pollution control equipment into the design at a new plant than it is to retrofit the same pollution control equipment in an existing plant. Because most new sources and existing sources face similar costs, EPA has determined that PSNS requirements should not pose a barrier to entry on the basis of competitiveness. EPA also has shown CP to be an economically achievable option, having an acceptable level of impact on existing sources. Therefore, the same requirements for PSNS also should have an acceptable level of impact on most new facilities.

EPA also examined whether there would be a barrier to entry for small new sources. EPA proposes not to exclude these new sources because it has found it to be economically achievable for these new sources to comply with the CP standards contained in the proposed rule. EPA investigated facilities that were identified as starting up during the time frame of the survey. Of these facilities, EPA determined that the average revenues of this group exceeded $4 million per year, and the amount of laundry processed averaged over 5 million pounds per year. Only 24 facilities out of 80 total newer facilities (weighted), or 30 percent, would meet the size threshold for the exclusion applicable to existing sources. On a yearly basis (given that 24 facilities started up over the 3 years of the survey) EPA estimates that up to 8 facilities of the size that would meet an exclusion similar to that for existing sources might be started up each year. Overall, in the group of 80 facilities, only 6 facilities (weighted) were identified as postcompliance closures (based on a closure by one surveyed nonindependent facility). No single-facility firm would close postcompliance. EPA is less concerned about a closure of a nonindependent facility, since nonindependent facilities often can fall back on their parent firm during the financially shaky first few start up years. Given the above results, EPA finds that not excluding new sources laundering less than one million pounds of incoming laundry per calendar year and less than 255,000 pounds of shop and/or printer towels/rags per calendar year from PSNS will be economically achievable and will present no barriers to entry.

EPA also investigated whether there might be a barrier to entry due to competitive disadvantages for all new sources in markets where excluded facilities are located. According to the Section 308 Survey, excluded facilities process only 0.7 percent of the laundry processed by all facilities represented in the survey. EPA thus concludes that the market share of excluded facilities is so small that excluded facilities are unlikely to have a measurable impact in the market for industrial laundry services. Furthermore, EPA has shown that even if no compliance costs are passed through to customers, the impacts are similar to the results assuming cost pass-through does occur, and thus new sources should be able to compete with excluded facilities on price (by not raising prices) even if they perceive the need. EPA thus concludes that competition with excluded facilities will not pose a barrier to entry.

1.6 FIRM FAILURE ANALYSIS

In the firm failure analysis, EPA uses the adjusted annualized costs to compute a change in earnings, assets, liabilities, and working capital at the firm level (accounting for costs for multiple facilities, where applicable). These postcompliance financial figures are used in a computerized model of financial health on a firm-by-firm basis. The model uses an equation known as Altman's Z", which was developed based on empirical data to characterize the financial health of firms. This equation calculates one number, based on the financial data, that can be compared to index numbers that define "good" financial health, "indeterminate" financial health, and "poor" financial health. All firms whose Altman's Z" number changes such that the firm goes from a "good" or "indeterminate" baseline category to a "poor" postcompliance category are classified as likely to have significant difficulties raising the capital needed to comply with the proposed rule, which can indicate the likelihood of firm bankruptcy, or loss of financial independence.

EPA estimates that the proposed rule under the CP option would result in 65 firms failing or losing their financial independence. The OC option is associated with 22 firm failures; COMBO is associated with 65 firm failures; and DAF is associated with 66 firm failures.

1.7 NATIONAL- AND REGIONAL-LEVEL IMPACTS ON EMPLOYMENT AND OUTPUT

In the employment analysis, EPA undertakes several types of analyses, all based in part on a type of analysis known as input-output analysis. These employment analyses include 1) a national-level analysis for estimating employment and output changes (gains and losses) throughout the U.S. economy in all industry sectors of the economy using both compliance costs (for the output and employment analyses) and employment losses driven by facility closures (for the employment analysis) to determine a range of possible gross and net (losses minus gains) impacts at the national level; 2) a regional impact analysis using employment losses driven by facility closures (closure losses) to determine whether impacts on individual communities might be experienced; and 3) an analysis using EPA's estimate of market-determined production losses to derive an estimate of direct, net employment losses in the industrial laundries industry alone. This last analysis is undertaken to determine losses within the industrial laundries industry alone because while closure losses can be considered the immediate impact of the proposed rule on the industry, production-driven losses might be greater or less than closure losses over time, as equilibrium in the market is attained. Furthermore, closure losses do not account for the fact that some portion of production workers might transfer wholly or in part to operating pollution control equipment, thus some accounting for employment gains within the industry is necessary.

1.7.1 National-Level Analysis

EPA uses input-output analyses to determine the effects of the regulation using national-level employment and output multipliers. Input-output multipliers allow EPA to estimate the effect of a loss in output in the industrial laundries industry on the U.S. economy as a whole. Every loss in output in the industrial laundries industry results in employment losses in that industry. Additionally, these losses have repercussions throughout the rest of the economy, and the output and employment multipliers allow EPA to calculate the total losses in output and employment nationally using the output loss estimated for the industrial laundries industry alone. EPA determines these impacts at the national level based on two measures: the compliance costs of the proposed rule and employment losses from projected postcompliance facility closures. The first measure directly translates increased costs of production into declines in output in the industrial laundries industry assuming no cost passthrough to customers and before any potential employment gains are accounted for. EPA considers this an upper bound estimate of employment losses across all industry sectors in the U.S. economy. The other measure based on employment losses from facility closures is considered a lower bound estimate of employment impact.

The costs of compliance translate into gains in other sectors of the economy, such as manufacturers of pollution control equipment. To compute output and employment gains at the national level, over all sectors of the economy, EPA uses the capital and operating costs estimated for pollution control equipment (which represent output gains in the industries that manufacture, install, and operate the equipment) along with the output and employment multipliers for those industries, to calculate a national-level gain in output and employment. These gains offset to some extent the losses attributable to the proposed rule.

Based on the output effects of the outlay of compliance costs by the industrial laundries industry or based on postcompliance closures, the proposed option would result in loss of employment at the national level in all industry sectors of 4,940 to 9,892 FTEs, which is 0.004 to 0.008 percent of national employment. It is important to note that these losses might not represent actual jobs, but reduction in hours work spread over numerous workers, over the entire U.S. civilian employed population. This loss represents 5 to 10 minutes of work per year per person on average. This employment loss is offset somewhat by gains in the industries that manufacture, install, and operate pollution control equipment. These gains total 4,358 FTEs, thus the net employment loss over the entire U.S. economy (not just in the industrial laundries industry) is 582 to 5,534 FTEs, which is only 0.0005 to 0.005 percent of the U.S. labor force in 1997. Output losses to the nation as a whole are expected to total a maximum of $460.9 million. The IL Standards would, however, result in offsetting gains among the pollution control equipment manufacturers, installers, and operators totaling $369.8 million in output. Net output loss is thus $91.1 million at most, which is only 0.001 percent of Gross Domestic Product in 1993. Thus EPA expects, at the national level, that the IL Standards would have negligible impact on U.S. employment and output.

1.7.2 Regional-Level Analysis

EPA also determined the impacts on regional-level employment, which is estimated using facility closures and employment at those closing facilities. EPA conducted a regional analysis because even if net employment effects (losses minus gains) are relatively small on a national level, an employment loss might still have a substantial negative effect on an individual community. These analyses are based on the use of Bureau of Economic Analysis RIMS II input-output regional (not national-level) multipliers. EPA used the regional-loss estimates using the facility closure-driven estimates of employment losses to perform a community impact analysis, which investigates the potential for impacts on community unemployment rates based on the immediate dislocation effects of facility closures. Firm failures were not considered in the job loss or community impact analyses because in all cases, these firms are single-facility firms whose facility is shown to be financially viable after complying with the rule. The impact of the proposed rule on these facilities thus might be the loss of their financial independence, as they would likely be purchased by a larger firm and continue to operate with all or nearly all employees. This is not always the case in all industries, but in this industry, facilities are geographically tied to their service areas and thus their production is not easily shifted to another geographic area. Furthermore, they are generally not asset-rich and are thus not suitable for acquisition for the purpose of selling off assets rather than for operation.

EPA determined that most closures will result in a maximum change in a community's unemployment rate of 0.32 percent or less with one exception. One surveyed facility has a statistical weight of 30, and if the weighted loss is assumed to occur in one community, the loss would be substantially overstated (representing a 3.42 percent addition to the community's unemployment rate). EPA investigated the location of facilities represented by the one closing facility associated with nearly all the employment impacts. No more than three facilities out of the 30 represented by the closing survey facility are likely to be located in any one community, so EPA concludes that no single community will sustain impact on its unemployment rate of greater than 1 percent.

1.7.3 Direct Net Employment Loss Analysis

Facility closure losses could overstate or understate employment losses strictly within the industrial laundries industry on a longer-term basis, since total longer-term employment losses are driven by production losses and employment losses from closures are driven by costs of compliance, and these two losses might not be equal. Therefore, EPA uses its market model to predict any reductions in production and the subsequent employment effects (production-driven effects) within the industrial laundries industry alone. This analysis also accounts for some gains within the industrial laundries industry due to a need for operators of pollution control equipment. This analysis also uses the national-level input-output multipliers to compute a direct loss of employment on the basis of output effects. EPA considers this employment loss the longer-term impact of the rule on the industrial laundries industry.

In addition to the offsetting gains seen at the national level, EPA determined that within the industrial laundries industry, many *nonclosing* facilities might actually experience gains in production (and thus gains in output and employment). EPA concludes this because when facilities close, other nonclosing facilities in the local market area might expand production to take over a portion of the closing facility's production. EPA concludes this because the longer-term production-driven losses in the industry are less than the losses EPA estimates on the basis of facility closures.

EPA estimates total direct job loss of 2,872 full-time equivalents (1 FTE = 2,080 hours of labor) as a result of the facility closures projected under the proposed rule. The employment losses associated with closures overstate actual longer term net losses to the industry, because some employment gains in the industry will occur (although the gains might not occur in the same geographic location or at the same time as the losses). These gains include operators of pollution control systems that might be hired by facilities and additional workers hired to expand some production at facilities located in market areas with facility closures (lost production from closures is estimated to exceed the amount of reductions required to meet market equilibrium conditions). EPA estimates the actual *net direct* losses in the industrial laundries industry would be 470 FTEs under the option (0.36 percent of total industry employment), considerably less than the number of direct losses predicted solely on the basis of closures. The OC option is associated with net, direct losses totaling 275 FTEs; COMBO is associated with net, direct losses totaling 456 FTEs; and DAF is associated with net, direct losses totaling 421 FTEs.

1.8 OTHER SECONDARY IMPACTS

EPA investigated additional secondary impacts qualitatively and quantitatively. These impacts include impacts on domestic and international markets, impacts on substitutes for industrial laundry services, impacts on industries that might offer some industrial laundering services, impacts on inflation, distributional impacts, and impacts on environmental justice. EPA also investigates the impact of the rule on domestic markets. The rule will affect domestic markets to the extent that excluded facilities can affect market share. EPA makes an assessment of the potential for effect on domestic market on the basis of pounds of laundry processed by excluded facilities to the total pounds processed by the industry.

EPA expects the proposed rule to have a minimal impact on international markets due to the limited number of facilities near international boundaries, the relatively high transaction costs associated with border crossings, and the ability of most facilities to absorb, if necessary, the full cost of the IL Standards without threat of closing or failing. Domestic markets might initially be slightly affected by the exclusion for very small facilities, since these facilities might not be subject to the same requirements; however, the number of these facilities, the small volume of their production relative to total industry production (0.7 percent), and the likelihood that they are not concentrated in any one market area, are expected to limit the effects of any competitive advantages they might have. EPA's economic analysis shows that there is a very slight increase in price ($0.003 per pound) and that customers are not very sensitive to price changes; therefore, dischargers subject to the proposed rule would be able to compete with those dischargers excluded from the proposed rule. Further, if any excluded facility annually launders more than one million pounds of laundry or more than 255,000 pounds of shop and/or printer towels/rags per calendar year, it will no longer be excluded from the standards. The small excluded facilities are also the most likely of any size group to exit the market regardless of the rule. Given these observations, it is likely that this group of existing sources would shrink in size over time, and any small market effects would be reduced.

EPA investigated the potential for the IL Standards to affect industries such as hotels, hospitals, prisons, manufacturing facilities, and others that might offer some industrial laundering services. EPA undertook a screener survey of 100 such facilities and determined that among the sampled facilities, only one laundered industrial items from offsite sources. This survey did not comprise a statistically representative sample of these types of facilities, so EPA cannot be certain the practice of laundering industrial items from offsite sources by these types of facilities is as rare as it seems. EPA estimates, however, that impacts on these types of facilities from the IL Standards, should they launder any industrial items from offsite sources, would be no more than and most likely less than impacts on the industrial laundry facilities surveyed in the Section 308 Survey for the following reasons.

- Flow from these facilities, even if they launder industrial textile items from offsite sources, might meet the requirements of the IL Standards without any additional pollution control equipment. For example, the amount of industrial laundry proportionate to, say, linens might be so small the facility could meet the standards without installing pollution control, the facility might already be subject to an effluent guideline that also controls the pollutants of concern for industrial laundry, or the entire laundry operation might meet the definition of the exclusion.

- Even if pollution control equipment were required, impacts are likely to be less than those on industrial laundry facilities surveyed in the Section 308 Survey because industrial laundering is not their major source of revenues—that is, they are primarily hotels, hospitals, prisons, manufacturing facilities, or others. In comparison, for many facilities surveyed in the Section 308 Survey, industrial laundry revenues are the primary or sole source of revenues. Facilities that only secondarily provide industrial laundry services would most likely have a larger revenue base than many of the Section 308 Survey facilities that launder a similar amount of industrial laundry, reducing the potential for impacts.

- If industrial laundry flow is small, wastewater hauling is likely to be a less expensive alternative than installing and operating pollution control equipment, contributing further to a lessening of potential impacts.

- These establishments might have the option to drop laundering of industrial textile items, particularly if revenues from this operation are only a small fraction of overall revenues, which could also lessen impacts.

EPA also expects the proposed rule to have minimal impacts on inflation, insignificant distributional effects, and no major impacts on environmental justice.

EPA also investigated impacts on customers. The agency obtained IRS data on the major customer groups and summed total operating costs for their major customers. Under the worst-case assumption that all compliance costs would be borne by only 10 percent of these major customers, EPA conservatively determined a percentage by which total operating costs might increase due to the proposed rule.

The price increase expected as a result of the proposed option is an average of $0.003 per pound, or 0.4 percent of current average price. Because this percentage increase is so small compared to even the modest rates of inflation currently experienced, it is unlikely that most customers would be able to distinguish this effect from the effect of inflation. If EPA assumes that only 10 percent of the customers in the major groups of customers absorb 100 percent of the cost of the rule, total compliance costs would increase customers' operating costs by an average of less than 0.02 percent. Therefore, EPA does not expect price increases to have a major impact on customers.

EPA also investigated the likelihood that customers might substitute disposable items for laundered items or begin operating onsite laundries. Both the substitution of disposable items for laundered items and the installation and operation of onsite laundries are associated with potential negative impacts on customers that might deter them from choosing these potential substitutes. Disposable items can be more expensive to use than laundered items, might not meet quality requirements (e.g., disposable printer towels tend to be linty) and are, in certain circumstances, regulated under other environmental statutes. Meanwhile because of the high initial costs to install equipment on-site and the small increase in price of industrial laundry services discussed earlier, onsite laundries could require years before any cost savings might be realized. Also, EPA's market model provides a means for estimating price increase and reduction in quantity demanded for industrial laundering services at the higher price. This analysis shows a very small decrease in production as a result the proposed rule, 0.3 percent of baseline production. Given the disincentives towards those substitutes indicated above, EPA does not expect the proposed rule to cause customers to substitute disposable items for laundered items or commence industrial laundering on site for industrial laundries services in any major way. The small reduction in production of 0.3 percent is more likely to occur from customers delaying cleaning (rather than weekly pickups of mats, for example, some might substitute biweekly pickups) or dropping certain rental items, such as uniforms used only for image purposes. This decline in production is negligible compared to the approximate 4 percent per year growth in revenues seen for the industry between 1990 and 1993, according to Section 308 data.

1.9 INITIAL REGULATORY FLEXIBILITY ANALYSIS

At this time, EPA has elected to perform an Initial Regulatory Flexibility Analysis as required by the Regulatory Flexibility Act as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA). EPA determined that a total of 69 firms that meet the SBA definition of small (see Section 1.3) would have annual compliance costs greater than 3 percent of their revenues. Using facility closures and firm failures as the measure of impact on small firms, EPA determined that 98 small firms might close or fail (or otherwise lose their financial independence) out of a total of 864 small firms in the analysis. This is 14.3 percent of small firms and 13.2 percent of all firms in the analysis. EPA therefore believes impacts on small firms are not disproportionate.

1.10 COST-BENEFIT ANALYSIS

Pursuant to Executive Order 12866 and Section 202 of the Unfunded Mandates Reform Act (UMRA), EPA performed a cost-benefit analysis. This analysis investigated the social cost of the regulation, measured as the pretax costs of compliance plus government administrative costs plus the costs of administering unemployment benefits.

EPA assessed three broad classes of benefits from the industrial laundries regulation: human health, ecological, and economic productivity benefits. Although EPA expects that benefits will accrue to society in all of these classes, data limitations prevented all of the classes from being fully quantified and monetized. As a result, the estimates from this analysis represent only a partial measure of the benefits likely to accrue from the proposed regulation. EPA estimated dollar benefits for the following categories: reduced cancer risk from fish consumption, increased value of recreational fishing opportunities, nonuse benefits, and reduced costs of disposal or use of sewage sludge from publicly owned treatment works (POTWs). Other benefit measures that were quantified include reduced occurrence of in-stream pollutant concentrations exceeding Ambient Water Quality Criteria (AWQCs) protective of human health or aquatic species, and reduced interference with POTW operations. Nonquantified benefit categories include: reduced noncancer health effects, reduced POTW operating and maintenance costs, reduced administrative costs at the local level to develop and defend individually derived local limits for industrial laundries, improved aesthetic quality of waterways near discharge outfalls, enhanced water-dependent recreation other than fishing, benefits to wildlife and to threatened or endangered species, tourism benefits, and biodiversity benefits. The findings for the monetized benefit categories are summarized below.

To estimate human health benefits from reduced cancer risk, EPA estimated the change in cancer risk from consumption of fish tissue using standard risk assessment methodologies. The change in risk was applied to an estimate of the exposed population to calculate the annual reduction in cancer cases. From this analysis, EPA estimated that the proposed regulation would eliminate approximately 0.040 cancer cases per year. Valued on the basis of estimated willingness-to-pay to avoid premature mortality, the avoided cancer cases yield annual monetary benefits of $0.09 to $0.5 million per year.

As a partial measure of ecological benefits, EPA assessed the increase in value of recreational fishing opportunities resulting from improved water quality. For this analysis, EPA estimated the number of pollutant discharge locations where before regulation, one or more industrial laundry pollutants exceed AWQCs for protection of aquatic species or human health, but after compliance, would meet these limits. From this analysis, EPA found that the regulation would eliminate the occurrence of concentrations exceeding AWQCs at 66 locations. EPA assessed the increase of value of recreational fishing at these locations based on estimated fishing activity at those locations before regulation, the estimated baseline value to consumers of the fishing activity, and the increase in value for recreational fishing resulting from elimination of contaminants from the fishery. EPA estimates that the proposed regulation will increase the value of recreational fishing opportunities by $1.70 to $6.08 million annually.

EPA also estimated nonuse benefits resulting from the improvements in water quality. Nonuse benefits are the benefits to persons who currently do not use the resource but who might at some future time want to use the resource or who benefit by knowing that the resource is available to them (or to others, including future generations). Prior studies have shown that nonuse values can be estimated as a ratio of use values (i.e., for recreational fishing): the estimated ratios range from 0.1 to 10, with a median of 1.92. For this analysis, EPA conservatively used a ratio of 0.5 to calculate nonuse values based on the estimated recreational fishing use values. The resulting values range from $0.85 to $3.04 million per year.

As a partial measure of economic productivity benefits, EPA assessed the extent to which reduced metals discharges by industrial laundries would permit POTWs to dispose of sewage sludge by less costly methods. In particular, some POTWs might be able to dispose of sewage sludge through beneficial land application instead of other more costly and less environmentally methods such as incineration or municipal landfills. EPA estimated the savings to POTWs from being able to shift to less costly methods based on the change in metals discharges and associated contamination of sewage sludge, the pollutant concentration levels limiting use of disposal methods, and the estimated savings from shifting to less costly methods. The estimated savings from reduced contamination of sewage sludge range from $0.005 million to $0.009 million annually.

The proposed option is expected to have a total annual social cost of $126.1 million, which includes $123.4 million in pretax compliance costs, $2.6 million in administrative (permitting) costs, and $0.1 million in unemployment benefits administration costs. EPA estimates that annual benefits will range from $2.6 million to $9.6 million, which includes $0.09 million to $0.5 million for human health benefits, $1.7 million to $6.1 million for recreational benefits, $0.9 million to $3.0 million for nonuse benefits, and $0.005 million to $0.009 million for POTW sewage sludge benefits.

SECTION TWO

DATA SOURCES

EPA relied on several data sources to develop the industry profile and the economic and financial analyses of the proposed IL Standards presented in this EA report. The following subsections discuss the principal data sources used. Additional data sources are described in Sections Three through Ten as they are referenced. All documents and databases cited in this report, except where noted (e.g., publicly available documents), are available in the rulemaking record.

2.1 THE 1994 INDUSTRIAL LAUNDRIES INDUSTRY DETAILED QUESTIONNAIRE

EPA used the *1994 Industrial Laundries Industry Detailed Questionnaire* (hereinafter referred to as the Section 308 Survey) to obtain detailed technical and financial information from a sample of 255 establishments engaged in industrial laundering that could potentially be affected by the proposed IL Standards. Data provided by the surveyed facilities included technical information on the quantity and types of items laundered; water use and waste characteristics; waste/wastewater treatment operations and waste minimization practices; cost of industrial laundry operations; and treatment capacity. The Survey also collected economic and financial data, such as the number of employees; industrial laundering revenues and costs; assets; liabilities; net income; ownership structure; discount rate; and market value of land, buildings, and equipment. The questionnaire collected economic and financial data at the facility, owner-company, and parent-company levels. EPA used these data extensively to develop the proposed rule for this industry.

EPA based the Survey sampling frame on two sources of population information: (1) the trade association listings, which were used to develop the population for the *1993 Industrial Laundries Industry Screener Questionnaire* (Screener Questionnaire) and (2) information from Dun and Bradstreet, which was used to develop the population for the *Industrial Laundries Industry Supplemental Screener Questionnaire* issued in 1994 (Supplemental Screener Questionnaire). See EPA's *Statistical Support Document for Proposed Pretreatment Standards for Existing and New Sources for the Industrial Laundries Point Source Category* (Statistical Support Document) for more information on how EPA developed the survey sampling frame. EPA also sent out another screener questionnaire in 1995, the *Hotels, Hospitals, and Prisons*

Screener Questionnaire (HHPs Screener Questionnaire). EPA used the information from the HHPs Screener Questionnaire to further clarify the regulatory scope of this rule.

EPA stratified the affected population according to the types of items laundered, types of wastewater treatment in place, and annual revenues.[1] Based on these strata, EPA developed "cells," which are the intersection of two sampling strata. For example, a survey could be stratified on the basis of revenue and treatment technology, which would each be considered a stratum. A cell in this example would correspond to a particular range of revenues and a treatment technology type. To select facilities to receive the detailed questionnaire, EPA took a census of all facilities that at the time of the survey had in-place treatment technologies such as air strippers, centrifuge, dissolved-air flotation, membrane filtration, pressure filtration, media filtration, and/or chemical precipitation, because these treatment technologies were considered likely options for the proposed regulation. EPA also took a census of all facilities with annual revenues less than $1 million that used dissolved-air flotation, oil/water separation, and/or chemical precipitation wastewater treatment technologies to learn more about how facilities in these sampling cells, despite their low revenues, were able to install advanced treatment systems as might be required by the regulation. In addition, EPA took a census of cells with fewer than five facilities to ensure that the most information possible on these more unusual types of facilities was collected. EPA took a representative sample from all remaining cells in the sampling frame. EPA's Statistical Support Document, provides more information on the stratification and development of survey weights for the Section 308 Survey.

2.2 GOVERNMENT DATA SOURCES

Facilities in the affected population are predominantly classified into one of four primary Standard Industrial Classifications (SICs):

- **SIC 7218: Industrial Launderers.** Establishments primarily engaged in supplying laundered or dry-cleaned industrial work uniforms and related work clothing, such as protective apparel (flame and heat resistant) and clean room apparel; laundered mats and rugs; dust control items, such as treated mops, rugs, mats, dust tool covers, and cloths; laundered wiping towels; and other selected items to industrial, commercial, and government

[1] The sampling frame stratified facilities into four categories based on types of items laundered, three categories based on types of wastewater treatment, and four categories based on revenues.

users. These items may belong to the industrial launderer and be supplied to users on a rental basis, or they may be the customers' own goods. Establishments included in this industry may or may not operate their own laundry or dry-cleaning facilities.

- **SIC 7213: Linen Supply.** Establishments primarily engaged in supplying to commercial establishments or household users, on a rental basis, such laundered items as uniforms, gowns, and coats of the type used by doctors, nurses, barbers, beauticians, and waitresses; and table linens, bed linens, towels and toweling, and similar items. Establishments included in this industry may or may not operate their own laundry facilities. Establishments primarily engaged in providing diaper service are classified in Industry 7219.

- **SIC 7211: Power Laundries, Family and Commercial.** Establishments primarily engaged in operating mechanical laundries with steam or other power. Establishments primarily engaged in supplying laundered work clothing on a contract or fee basis are classified in Industry 7218.

- **SIC 7216: Dry-cleaning Plants, Except Rug Cleaning.** Establishments primarily engaged in dry-cleaning or dyeing apparel and household fabrics other than rugs. Press shops and agents for dry-cleaners are classified in Industry 7212; establishments primarily engaged in cleaning rugs are classified in Industry 7217; and establishments primarily engaged in dyeing fabrics for trade are classified in Manufacturing, Major Group 22.

The SIC codes listed above translate to a new numbering system called the North American Industry Classification System (NAICS). A translation chart for these codes is provided in Table 2-1.

EPA used U.S. Department of Commerce data for these SICs in developing the market model discussed in Appendix A. The Department of Commerce collects a wide range of industry data, including number of establishments, number of employees, annual payroll, and annual receipts, at the 4-digit SIC level. These data are reported in U.S. Census Bureau publications such as County Business Patterns and the Service Annual Survey (exact citations appear where data are used in the EA).

EPA also used other government data, such as the Bureau of Labor Statistics' producer and consumer price indexes, in developing the market model. EPA further used the indexes to inflate and deflate Section 308 Survey financial data, as reported in Sections Five and Six.

Table 2-1

Conversion From SIC to NAICS Codes

SIC	NAICS
7218: Industrial Launderers	812332
7213: Linen Supply	812331
7211: Power Laundries, Family and Commercial	812321
7216: Dry Cleaning Plants, Except Rug Cleaning	812322

2.3 OTHER SOURCES

EPA's *Technical Development Document for Proposed Pretreatment Standards for Existing and New Sources for the Industrial Laundries Point Source Category* (hereinafter, the Development Document) is the major source of technical information about the industry presented in Section Three; it is also the source of capital and operating and maintenance cost estimates for the regulatory options evaluated in this EA.

EPA further supplemented questionnaire and government data with information from a number of other sources: the industry trade journals *Industrial Launderer*, published by the Uniform & Textile Service Association, and *Textile Rental*, published by the Textile Rental Services Association of America, provided details on changing laundering processes, new technologies, and industry perceptions of the industrial laundries market. In addition, EPA referenced several studies sponsored by the Uniform & Textile Service Association (formerly the Institute of Industrial Launderers) that examined the customer base for industrial laundries and the markets for wipers and mats, as well as the industry as a whole. EPA's 1989 *Preliminary Data Summary for Industrial Laundries* provided information about the overall industry. Lastly, information from investment sources, such as the equity research division of Barrington Research Associates, aided EPA in producing its financial profile of the industry.

SECTION THREE

INDUSTRY PROFILE

3.1 INTRODUCTION

The industrial laundries industry comprises establishments engaged in supplying laundered or dry-cleaned industrial work uniforms and related textiles, such as shop towels, mats, and dust mops, to industrial, commercial, and government users. The proposed rule for the industrial laundries industry (the IL Standards) would establish pretreatment standards for those industrial laundry facilities discharging wastewater to publicly owned treatment works (POTWs); there are no known industrial laundries discharging directly into receiving waters.[1] Compliance with pretreatment standards might require industrial launderers to purchase and install wastewater pretreatment systems, send certain items offsite for laundering, or contract for offsite wastewater treatment, and monitor pollutant concentrations in wastewater.

This section presents a profile of the industrial laundries industry as defined by EPA for the purposes of the proposed IL Standards. Only facilities with laundering discharges will be regulated; administrative offices and depots established for the purposes of marketing, retailing, and/or distributing laundered items are out of the scope of the regulation and were not included in the Section 308 Survey. Laundries engaged in onsite laundering at industrial facilities also are not covered by the IL Standards. The rationale for omitting these facilities is discussed in detail in the preamble. Some of these laundries are already covered by effluent guidelines for other industry categories (e.g., pesticides). Moreover, data from the 1995 HHPs Screener Questionnaire indicates that facilities engaged in onsite laundering at hospitals, hotels, and prisons generally do not launder items for offsite customers. Further follow-up work indicates that those onsite laundries that do launder items from off site generally do not handle "industrial" items.[2]

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[1] Based on data from the 1993 Screener Questionnaire and 1993 Supplemental Screener Questionnaire.

[2] Anne Jones, ERG, 1997. "Analysis of hospitals, hotels, and prisons (HHPs) database." Memorandum to the Rulemaking Record. February 21.

The purpose of this profile is to provide a baseline description of the current activities, structure, and performance of the industrial laundries industry. The industry's characteristics and market structure serve as foundations for developing the methodology used elsewhere in this EA to analyze the potential impacts associated with the proposed IL Standards. Information presented in this section is drawn, for the most part, from industry and government literature on industrial laundries and from the Section 308 Survey.

Section 3.2 provides an overview of the industrial laundries industry and the processes involved in industrial laundering. Section 3.3 summarizes the structure of the industrial laundries market, and Section 3.4 gives a more detailed breakdown of industry demographics and the facilities affected by the regulation. It also provides baseline descriptive and financial information related to the industry's ability to absorb potential regulatory costs.

3.2 OVERVIEW OF THE INDUSTRIAL LAUNDRIES INDUSTRY

3.2.1 Services Provided

The industrial laundries industry was established in the period during and immediately after World War II, when the growth of the industrial sector resulted in increasing interest in services geared toward providing clean work apparel, clean work materials, and a clean work environment. Over time, as the service sector of the economy expanded, industrial laundries also became involved in providing customers with uniforms and textile goods designed to promote safety, corporate identity, and company image. As a result, industrial laundry services are currently used by a variety of industrial, commercial, and government organizations.

Industrial laundries can be found throughout the United States because of the diversity of customers they service. Facilities tend, however, to be concentrated in metropolitan areas and the more populated states (California, Texas, New York, and Florida), where the service sector is relatively large, and in the heavily industrialized Rust Belt states (Ohio, Illinois, Michigan, Pennsylvania, and Indiana).[3]

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[3] U.S. EPA, 1989. *Preliminary Data Summary for Industrial Laundries*. Washington, DC: Office of Water Regulations and Standards. September.

Industrial laundries supply customers with water-washed uniforms and related work items through a complex distribution system. (Note that some items may be water washed in series with other processes such as dry cleaning or oil treatment.[4]) The launderer gathers items from customers for cleaning and returns these items after they have been laundered and, if necessary, repaired and/or pressed. The launderer might also personalize items for some customers. For the most part, industrial laundries own the goods they process and supply them to customers on a rental basis; however, some facilities also launder customer-owned uniforms and textiles, which the industry refers to as "Not Our Goods" (NOGs). Direct sales of products also can account for a small portion of industrial laundries' business. Thus, industrial laundries might be engaged in a variety of activities in addition to the actual cleaning of work garments and associated goods.

3.2.1.1 The Needs of Different Customers: Functional Cleaning and Cleaning for Convenience

Industrial laundries have a wide variety of customers. From the industry's perspective, "just about any type of business is a potential customer."[5] Consistent with this, data from the most recent customer profile survey conducted by the Uniform and Textile Service Association (UTSA) indicates that no single industry sector dominates the industrial laundries customer base.[6] When customers are grouped according to SIC category, only automotive dealers and service stations (SIC 55) and companies involved in automotive repair, services, and parking (SIC 75) account for more than 10 percent of industrial laundries' customers (10.1 percent each).[7] Furthermore, the 15 largest segments of the industrial laundries customer base in 1995 (listed in Table 3-1) account for less than two-thirds of all industrial laundries' customers.[8] This pattern is similar to that observed in the 1993 customer profile report: automotive services, dealers, and service stations

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[4] Establishments engaged in dry cleaning only or oil treatment only are not covered by the proposed IL Standards.

[5] 1996. "The super SICs." *Industrial Launderer*. October, pp. 53-54, 56.

[6] UTSA, 1996. *Customer Profile Analysis*. Arlington, VA: UTSA. The survey database included information on 3,739 randomly selected customer accounts from 22 UTSA member companies.

[7] *Ibid.*

[8] *Ibid.*

Table 3-1

The Top 15 Customer Industries for Industrial Launderers, for All Products, 1995

Major SIC Group	Title	% of Customer Base
55	Automotive Dealers & Service Stations	10.1%
75	Auto Repair, Services, and Parking	10.1%
58	Eating and Drinking Places	7.5%
54	Food Stores	5.3%
17	Special Trade Contractors	3.6%
50	Wholesale Trade -- Durable Goods	3.6%
35	Industrial Machinery and Equipment	3.3%
27	Printing and Publishing	3.1%
73	Business Services	2.7%
20	Food and Kindred Products	2.4%
80	Health Services	2.3%
34	Fabricated Metal Products	2.2%
82	Educational Services	2.1%
51	Wholesale Trade -- Nondurable Goods	2.1%
59	Miscellaneous Retail	2.0%
	Total, Top 15 Customer Categories	**62.4%**

Source: UTSA, 1996. Customer Profile Analysis, Table 2. Washington, DC: UTSA.

represented the largest customer groups, but, in general, businesses in each two-digit SIC category constituted only a small portion of the industry's overall customer base.[9]

Blue-collar businesses at which petroleum- and carbon-based substances are used (e.g., automobile repair shops, dealers, and gas stations) are the traditional purchasers of industrial laundry services. Uniforms and textiles (especially shop towels and mats) in such environments can become heavily soiled with oil, gasoline, and grease. Printers and publishers also represent a significant portion of the customer base for industrial laundries; towels used in the print shop can become highly contaminated with hazardous compounds, including paint, ink, and solvents. Other businesses using industrial laundries services include the metal fabrication and chemical industries. For all these customers, industrial laundries can offer an effective means of cleaning highly soiled items for reuse. The traditional blue-collar market still accounts for approximately 50 percent of garments rented.[10]

As the industrial laundries customer base broadened from purchasers desiring simple functionality to include purchasers concerned with appearance and corporate identity, the volume of moderately to lightly soiled items laundered by the industry also grew. Eating and drinking establishments, wholesale and retail trade businesses, and food stores use industrial laundries in part because uniforms serve as a means of cultivating a more distinct public image and encouraging employee identification with the larger organization. In addition, industrial laundry services offer a convenient means of handling garments without requiring either direct garment purchase programs in the workplace or worker maintenance of clothing.

3.2.1.2 Products

Uniform rentals account for the largest portion of industrial laundries' customer base and revenues; according to UTSA's 1996 customer profile analysis, nearly 60 percent of industrial laundries' customers

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[9] Institute of Industrial Launderers (IIL), 1993, *Customer Profile Analysis: Identification of Sources of Uniform and Textile Service Industry Customers by Product by SIC Code*. Washington, DC: IIL. (Prior to November 1993, the UTSA was known as the IIL.

[10] UTSA, 1996. *Op. cit.*

rent uniforms (see Table 3-2).[11] Other products rented include mats, mops, shop and print towels, continuous roller towels, and linen. These products are often "add-ons" to uniform rentals, although many customers renting mops and linen do not rent uniforms.[12]

Table 3-3 indicates the percentage of industrial laundries laundering each category of rental textiles, based on responses to the Section 308 Survey. A detailed description of the major items rented and how they are used follows:

- *Uniforms.* Traditionally, uniform rentals were geared toward meeting the need for clean work clothes in blue-collar industries. As noted above, however, once the garment rental market expanded to include customers interested in improving corporate identity and image, in addition to maintaining the cleanliness of work apparel, the number of businesses renting uniforms more for convenience than function increased. Today, the uniform rental market is almost evenly split between industrial and nonindustrial customers.[13] The automotive sales and services industries account for a significant proportion of the industrial customer base, and, as such, some of the main contaminants found in uniform laundry wastewater are oil and grease (as n-hexane extractable material [HEM]) and total organic carbon (TOC).[14] Uniforms rented primarily for identity and image purposes tend to be less soiled and to require less intensive laundering than those rented for functional purposes.

- *Mats.* Mats are used particularly in high soil areas, such as manufacturing plants or automobile repair shops, to prevent the spread of dirt. Mat rental is thus typically geared toward providing a clean work environment. Customers renting uniforms often also rent mats. As with uniforms, though, there has been a shift in the demand for mats; mats are now employed in lower-soil situations for fashion, as well as function.[15] Reflecting this shift, the mat rental market has grown faster than the market for any other industrial laundries rental

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[11] UTSA, 1996. *Op. cit.* (Table 1).

[12] IIL, 1993. *Op. cit.*

[13] *Ibid.*

[14] See EPA's Development Document.

[15] IIL, 1989. *An Analysis of the Industrial Laundry Industry.* Washington, DC: IIL. June.

Table 3-2

Percentage of Total Customer Base Renting Each Type of Product, 1995

Product	Percentage of Customer Base*
Uniforms	58.6%
Mats	48.3%
Mops	18.6%
Shop Towels	33.2%
Continuous Roll Towels (CRTs)	11.2%
Table and Bed Linen	4.4%
Aprons and Bath Towels	12.9%
Not Our Goods (NOG) Items	2.5%
Other Products	17.5%

* Percentages do not sum to 100 because customers may rent more than one type of product.

Source: UTSA, 1996.
Customer Profile Analysis, Table 1.
Washington, DC: UTSA.

Table 3-3

Textiles Laundered by Industrial Laundries

Textile Type	% of Laundries Handling Textile Type
Industrial Garments	82%
Shop Towels and Printer Towels	78%
Floor Mats	94%
Mops, Dust Cloths, and Tool Covers	80%
Linen Supply Garments	54%
Flatwork/Fulldry	78%
Health Care Items	37%
Fender Covers	39%
Continuous Roll Towels	53%
Clean Room Garments	2%
Other	17%

Source: Section 308 Survey (based only on facilities for which there is sufficient information).

product,[16] experiencing double-digit growth in recent years.[17] In low-soil situations, however, mat rental from industrial launderers might not offer customers significant advantages over purchase. The type and quantity of soils found in mats vary based on the settings in which they are used; contaminants that can be found in mat wastewater include oil and grease (as HEM), biochemical oxygen demand (BOD_5), total suspended solids (TSS), metals such as aluminum and iron, and salt and sand.[18]

- *Mops.* Mops are designed to meet the need for a clean working environment by removing soils and controlling dust. Unlike other rental items, mops are generally not "add-ons" associated with uniform rentals; customers using industrial laundry services to obtain clean mops might not rent any other products. The soils in mops handled by industrial launderers reflect the soils present at the various customer sites. Pollutants found in relatively high concentrations in mop wastewater include TSS, oil and grease (as HEM), and metals such as aluminum and iron.[19]

- *Shop towels and printer towels/rags.* Industrial launderers process shop towels and printer towels/rags, also known as industrial wipers, to provide customers with clean work materials. Shop towels are used primarily by the industries that comprise the traditional industrial laundries customer base (i.e., auto repair shops, machine shops, printers, etc). The towels are highly absorbent and are designed to wipe oil, grease, paint and ink, and solvents off equipment. Because of the way in which shop and printer towels are used, wastewaters from the towels have generally been found to contain much higher pollutant loads than the wastewaters from all other items cleaned by industrial laundries.[20] Shop and printer towel wastewater has been found to contain high concentrations of BOD_5, oil and grease (as HEM), total petroleum hydrocarbons (TPH, as SGT-HEM), TOC, and TSS. Shop towels are also a major source of hazardous pollutants found in industrial laundries' effluent; they often contain volatile organic compounds (VOCs) and semivolatile organics such as tetrachlorethene, ethylbenzene, 1,1,1-trichloroethane, and toluene, and toxic metals such as copper, lead, chromium, and zinc, among other pollutants.[21] Industrial launderers therefore generally require more water and chemicals to clean shop towels than to clean other items. As a result, and in anticipation of future environmental regulation, some laundries refuse to rent or clean shop towels, while others charge by weight for shop towel cleaning to encourage customers to perform some cleaning before the towels are picked up. In one case study, a print shop using a centrifuge to extract excess solvents from shop towels found that

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[16] *Ibid.*

[17] Arena, Richard, 1996. "Larger reusable mats combat disposable alternative." *Industrial Launderer*. July, p. 25.

[18] See EPA's Development Document.

[19] *Ibid.*

[20] See EPA's Development Document, Chapter 5.

[21] See EPA's Development Document.

this not only reduced compliance problems for its launderer, but it also resulted in net savings for the shop by allowing for more reuse and recycling of solvents.[22] Section 308 Survey data indicates that only 1.4 percent of industrial laundries are exclusively devoted to shop towel cleaning. There may, however, be an opportunity for industrial launderers to establish a market niche with little competition by cleaning shop towels. For example, Brent Industries, which devotes about 30 percent of its business to dry cleaning followed by water washing of shop and printer towels, has grown in the last 5 years from a single facility to three facilities and three depots, with plans for additional expansion.[23] EPA also found facilities laundering primarily shop and printer towels during site visits to industrial laundries conducted as part of the regulatory process.[24]

3.2.2 Industry Processes

3.2.2.1 Laundering Techniques

The three primary cleaning techniques employed by industrial launderers are water washing, dry cleaning, and dual-phase laundering. Water washing is the most commonly used process; approximately 97 percent of industrially laundered items are water washed.[25] Dry cleaning, which uses solvents to dissolve soils at low temperatures, accounts for less than 1 percent of items laundered, as does dual-phase cleaning, which uses solvents and water in series on items with both water-soluble and organic solvent-soluble soils.[26] Other processes, such as oil treatment of dust mops, represent a very small portion of industrial laundries' business as well.

Water washing and dual-phase laundering are the most relevant processes of concern for the proposed IL Standards, because both produce wastewater. Launderers exclusively engaged in oil treatment of

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[22] 1995. "Printer's use of friendlier solvents pays off for all." *Industrial Launderer*. September, pp. 51-52.

[23] 1997. "Tackling the toughest textiles." *Industrial Launderer*. January, pp. 27-28, 71.

[24] *Site Visit Report*, DCN L03977; confidential business information (CBI) material in the Rulemaking Record.

[25] See EPA's Development Document.

[26] See EPA's Development Document, Table 4-4.

mops (which generates no wastewater) or dry cleaning (which generates little if any wastewater) will not be covered by the IL Standards.

EPA's Development Document provides a detailed description of industrial laundering processes. In general, when items to be cleaned arrive at the industrial laundering facility, they are first sorted on the basis of fabric type, color, type of garment, and soil constituents. Stains that could be set by washing are pretreated, which may involve soaking and/or application of acids, bleaches, or solvents directly to the stains. There are a variety of industrial washing machines, but regardless of the type of washer used, all water washing by industrial laundries involves the following basic steps:

- *Flush*. Soiled items are subjected to an initial rinsing, or flush, which removes loosely attached soils.
- *Break*. Alkaline chemicals are added to wash waters to swell the fibers in the cloth and facilitate soil removal. Detergents can also be added at this time.
- *Wash cycle(s)*. During the wash cycle, chemicals and detergents are added to wash waters, and the items are agitated. The amounts and types of chemicals or detergents added depend on the soils being treated. Wash cycles can be followed by the addition of bleaching, blueing, or brightening chemicals.
- *Rinse*. Between wash cycles and following the last wash cycle, items are rinsed. Chemicals can be added during this process to neutralize any remaining bleach (anti-chlor) and to reduce water pH to prevent yellowing of garments (sour). Other additives that might be applied at this time are starch, oil treatment chemicals, water conditioners, dyes, stain treatment chemicals, and bactericides.
- *Extraction*. During the extraction process, excess rinse water is removed from the items laundered. This water typically contains dissolved and suspended soils.

Cleaned items are then dried, pressed, inspected for wear, folded, and delivered back to customers.

3.2.2.2 Labor Intensity

Although much of the actual cleaning process is mechanized, industrial laundering is still relatively labor intensive. Industrial laundries require large numbers of comparatively unskilled in-plant production workers, in addition to managers, sales representatives, and delivery truck drivers. These in-plant workers maintain and operate equipment controls for washers and dryers. Additional labor is required for sorting and routing items to the appropriate customers. Thus, although some parts of the process, such as soil sorting, transferring of laundry from washers to dryers, material handling, and garment labeling have become largely automated, laundered items often must be handled manually several times before they are returned to the customer.[27]

Efforts are underway to develop fully automated, continuous systems for handling industrial laundry. For the most part, however, laundries have been slow to adopt technological advancements. In addition, because labor is relatively inexpensive, automation only makes sense for certain small- to medium-sized facilities that are able to eliminate a second- or third-shift crew by upgrading their equipment; larger facilities or facilities operating only a single-shift crew can generally achieve significant savings simply by utilizing existing resources more efficiently.[28] Thus equipment manufacturers have had few incentives to fund research and development in the area of laundries automation. In recent years, industrial launderers have shown more interest in purchasing new technology to improve quality control and increase capacity for growth, particularly as older machinery wears out.[29,30] It is, nevertheless, likely that labor will continue to be a significant input in the industrial laundering process for the foreseeable future.

3.2.3 Classification of Facilities Performing Industrial Laundering

3.2.3.1 Census Classifications

The U.S. Department of Commerce divides the laundering industry into several subcategories, each corresponding to a different four-digit SIC code. These classifications can be useful in interpreting Department of Commerce data on industry performance, employment, consumption, etc.

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[27] IIL, 1989. *Op. cit.*

[28] Murphy, Ed, 1997. "How to avoid the high cost of plant expansion." *Industrial Launderer.* February, pp. 47-48, 50.

[29] 1996. "Association poised to meet industry's operational challenges." *Industrial Launderer.* December, pp. 13-14, 16.

[30] Hobson, David F., 1997. "Industry trend watch." *Industrial Launderer.* January, p. 72.

Although there are facilities meeting EPA's definition of an industrial laundry in almost all the SIC subcategories of the laundering industry, four SIC codes are particularly relevant for the purposes of the proposed IL Standards.[31] These are SIC 7218, Industrial Launderers; SIC 7213, Linen Supply; SIC 7211, Power Launderers, Family and Commercial; and SIC 7216, Dry-cleaning Plants, Except Rug Cleaning (see Section Two for definitions).

Facilities engaged in industrial laundering tend to be classified into one of these groups. SIC codes, however, do not provide an exact means of distinguishing between industrial and nonindustrial laundries. Many firms assigned a primary SIC code of 7211, 7213, or 7216 have a secondary (or even tertiary) code of 7218, and vice versa. Consequently, it would be too limiting to consider only laundries with a primary SIC code of 7218 to be industrial laundries. Furthermore, each SIC category can include independent sales, administrative, and distribution centers, as well as facilities actually involved in laundering; not all the facilities in SIC 7218 are actually laundering textiles. SIC groupings therefore are not used in this EA as a baseline for assessing possible impacts of the proposed standards. The IL Standards will specifically cover launderers involved in water washing of industrial textile items (although these same launderers can also have in-house sales, administrative, and distribution capabilities) and will thus pertain to a subset of the facilities classified in several SIC subcategories, primarily SICs 7211, 7213, 7216, and 7218.

3.2.3.2 Classification of Industrial Laundries for Regulatory Purposes

Given that facilities engaged in industrial laundering can be found in all of the various SIC subcategories of the laundering industry, EPA also does not use SIC codes to determine which laundries will be covered by the proposed IL Standards. The breakdown of primary and secondary SIC codes for the facilities meeting EPA's definition of an industrial laundry for purposes of the proposed rule is given in Table 3-4. Data in the table are based on the Section 308 Survey. As the table indicates, although many of the facilities in this analysis are classified by the U.S. Department of Commerce as primarily industrial laundries (SIC 7218), the number of facilities that launder industrial textiles but are classified primarily as linen suppliers (SIC 7213), power launderers (SIC 7211), or dry-cleaning plants (SIC 7216) is also substantial.

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[31] SIC codes translate now to a new numbering system called the North American Industry Classification System (NAICS). See Section Two of this EA for the NAICS codes relevant for the industrial laundries industry.

Table 3-4

Primary and Secondary SIC Codes Reported by Industrial Laundries

PRIMARY SIC CODES	Number of Facilities	SECONDARY SIC CODES*										
		2269 Finishers of Textiles**	5047 Medical, Dental, and Hospital Equipment and Supplies	5085 Industrial Supplies	5136 Men's & Boys' Clothing and Furnishings	72 Personal Services	7211 Power Laundries, Family and Commercial	7213 Linen Supply	7215 Coin-Operated Laundries & Drycleaning	7216 Drycleaning Plants, Except Rug Cleaning	7218 Industrial Laundries	7389 Business Services**
72-Personal Services	1	0	0	0	0	N.A.	0	0	0	0	1	0
721-Laundry, Cleaning, and Garment Services	1	0	0	0	0	0	0	0	0	0	0	0
7211-Power Laundries, Family and Commercial	138	0	0	0	0	0	N.A.	61	0	6	61	0
7213-Linen Supply	615	0	0	0	0	0	119	N.A.	2	0	177	0
7216-Drycleaning Plants, Except Rug Cleaning	42	0	0	0	0	0	22	0	0	N.A.	20	0
7218-Industrial Launderers	926	1	7	1	1	13	11	295	0	1	N.A.	11
7219-Laundry and Garment Service**	1	0	0	0	0	0	0	0	0	0	0	0
7359-Equipment Rental and Leasing**	22	0	0	0	0	0	0	22	0	0	0	0
8980***	1	0	0	0	0	0	0	1	0	0	0	0
Totals	1,747	1	7	1	1	13	151	379	2	7	259	11

* Secondary SIC code included only for those facilities reporting this information. Number of facilities reporting secondary SIC codes does not equal number of facilities reporting primary SIC codes.
** Not elsewhere classified.
*** SIC code as reported by the surveyed facility. Not an actual SIC code.

Source: Section 308 Survey.

As noted in the preamble to the proposed rule, industrial laundries facilities are facilities that launder industrial textile items from offsite as a business activity (i.e., that launder industrial textile items for other business entities for a fee or through a cooperative arrangement). This definition includes textile rental companies that perform laundering operations; the industrial-laundered textile items may be owned by either the industrial laundry facility or the offsite customer. Laundering means washing with water, including water washing following dry cleaning (dual-phase laundering). (The rule does not apply to laundering exclusively through dry cleaning.) For facilities covered under the industrial laundry definition, wastewater from all water washing operations would be covered, including the washing of linen items as long as these items do not constitute 100 percent of the items washed. Industrial textile items include, but are not limited to, shop towels, printer towels/rags, furniture towels, mops, mats, rugs, tool covers, fender covers, dust-control items, gloves, buffing pads, absorbents, uniforms, filters, and clean room garments.

3.2.3.3 Launderers Not Covered by the Effluent Guideline

Certain launderers specifically do not meet the definition of an industrial laundry for the purposes of the proposed IL Standards. As discussed in the preamble to the proposed rule, discharges from onsite laundering at industrial facilities; laundering of industrial textile items originating from the same business entity; and facilities that exclusively launder linen items,[32] denim prewash items, new items (i.e., items directly from textile manufacturers, not yet used for their intended purpose), any other items that come from hospitals hotels or restaurants, or any combination of these items are not covered by the rule. In addition, the rule does not apply to the discharges from oil-only treatment of mops.

[32] EPA defines linen items as: sheets, pillowcases, blankets, bath towels, washcloths, hospital gowns and robes, tablecloths, napkins, tableskirts, kitchen textile items, continuous roll towels, laboratory coats, household laundry (such as clothes, but not industrial uniforms), executive wear, mattress pads, incontinence pads, and diapers. This list is meant to be inclusive. See the preamble to the proposed rule for additional discussion of regulated entities.

3.3 THE STRUCTURE OF THE INDUSTRIAL LAUNDRIES INDUSTRY

3.3.1 Numbers and Types of Facilities and Firms

Based on Section 308 Survey data, EPA estimates that 1,747 facilities in the United States meet its definition of an industrial laundry. These facilities all engage in laundering of some industrial uniforms or textiles, although this is not necessarily their only or primary activity. As discussed above, the Section 308 Survey is the main source of industry information used in this EA; data based on SIC classifications generally do not coincide with the firms and facilities involved in industrial laundering activities as defined by EPA.

Given the nature of the work performed by industrial launderers, many industrial laundries are small, independently owned, single-facility firms that rent and launder textiles for customers in a specific locality. The local focus of the industry stems, in part, from the fact that, to provide a service that involves delivering and retrieving items directly to and from the customer, the distribution area serviced by the typical industrial laundry is not very large. On average, according to Section 308 Survey data, industrial laundries service customers within 125 miles. Some "niche" laundries, which handle very specific types of items or soils (e.g., highly contaminated gloves or shop towels), have larger service areas. For example, Brent Industries, a company that rents and launders gloves and shop towels both to laundries and directly to industrial customers, provides services in 24 states.[33]

In recent years, the number of larger, multifacility industrial laundry firms has increased, in part due to changes in tax regulations. Much of this growth has occurred through industry consolidation, or expansion by acquisition, rather than through independent development of multiple plants by a single owner or parent firm.[34,35] After the economy rebounded from the recession of the early 1990s and the business environment improved, the rate of consolidation slowed somewhat, reflecting an apparent decline in the number of small

[33] 1997. "Tackling the toughest textiles." *Industrial Launderer*. January, pp. 27-28, 71.

[34] Paris, Alexander, Jr., 1994. *Equity Research: Uniform Services*. Barrington, IL: Barrington Research Associates. November 22.

[35] IIL, 1989. *Op. cit.*

facility owners interested in selling their companies[36] but not necessarily a decline in large firm owners' interest in expansion.

Larger, multifacility firms typically resemble their smaller, single-facility counterparts in that they operate in local markets, although a few may have national accounts as well.[37,38] In competing for customers, it is generally an advantage for an industrial launderer to have a local presence and knowledge of the local business environment. As mentioned above, industrial laundries are also geographically limited because customers must, for the most part, be within easy driving distance. Larger firms may, however, have slightly larger service areas than smaller firms because they are often more able to make use of depots for delivery purposes.

On the facility level, few significant economies of scale in industrial laundering are apparent; production efficiency is more closely related to the age of a facility's technology than to size. According to industry sources, efforts at consolidation are aimed more at purchasing customer accounts than at achieving cost saving; there is no reduction in labor needs at consolidated facilities.[39] Nevertheless, larger firms might experience some advantages from being able to invest more heavily in marketing, technological improvements, and the development of professional management staff.

Reflecting the fact that individual industrial laundry facilities can have very different ownership structures, the Section 308 Survey classified facilities into five categories:

- A—Facilities having an owner company that is subsumed under another company or legal entity that, in turn, is owned by an ultimate parent company.
- B—Facilities having an owner company that is subsumed under an ultimate parent company.

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[36] 1996. "Investment analyst sees healthy '96 for uniform rental with internal growth and acquisitions." *Industrial Launderer.* January, p. 12.

[37] Paris, Alexander, Jr. 1994. *Op. cit.*

[38] 1996. "Association poised to meet industry's operational challenges." *Industrial Launderer. Op. cit.*

[39] Knight, Lynn, ERG, 1993. "Interview and site visit with Brian Keegan, Unifirst." June 10. CBI material in the Rulemaking Record.

- C—Facilities that are also owner companies (and maintain their own financial records), but that are subsumed under an ultimate parent company.

- D—Facilities having an owner company.

- E—Independent facilities (where the facility maintains its own financial records and is also the owner company).

For purposes of some of the analyses discussed in this EA, facilities are examined in two groups (A, B, and D combined, and C and E combined). Generally, ABD firms are analyzed at the owner-company level, as multifacility firms, and CE firms are analyzed as single-facility firms.[40]

Table 3-5 provides a breakdown of facilities and firms by chain of ownership. The estimated 1,747 facilities correspond to 903 firms. The 917 ABD facilities are associated with 73 multifacility firms. The 830 CE facilities are single-facility firms (Section 308 Survey results).

3.3.2 The Market for Industrial Laundering Services [41]

The industrial laundries industry operates in many small markets, not one national market, reflecting the local focus of the businesses discussed above. Although some localities are dominated by a single firm or a handful of firms, the typical market for industrial laundering services appears to be quite competitive. The general characteristics of the industry also are consistent with what might be expected in a competitive situation. Nothing suggests that individual laundries are engaging in monopolistic or oligopolistic pricing strategies (except, possibly, in certain isolated markets); furthermore, even industry sources describe

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[40] See the Section 308 Survey for more information on firm-level classification.

[41] Appendix A of this EA investigates the industrial laundries market, deriving both a supply and demand curve for the market for use in determining the extent to which industrial laundries might be able to increase prices to reduce facility- and firm-level impacts of the proposed IL Standards. Appendix A provides confirmation of the assumption that the market is relatively competitive. The industry is estimated to be able to pass through only a fraction of the costs of compliance (32 percent). In a noncompetitive market, the percentage of costs passed through would be much closer to 100 percent. The fact that costs can be passed through at all reflects the fact that the demand for industrial laundering is relatively inelastic (i.e., demand does not change dramatically when price changes).

Table 3-5

Number of Firms and Facilities, by Chain of Ownership

Chain of Ownership	Total Number*
Facilities	
Type A	92
Type B	336
Type D	489
Total A\B\D	**917**
Type C	129
Type E	701
Total C\E	**830**
Total Facilities	**1,747**
Firms	
Multifacility firms	**73**
Single-Facility firms	**830**
Total Firms	**903**

*Weighted

Source: Section 308 Survey.

competition for customers as strong, particularly with regard to price.[42] Most of this competition centers around existing accounts, although the UTSA, one of the industry trade associations, is encouraging industrial launderers to expand into new markets.

3.3.2.1 Competitiveness in the Industrial Laundries Market

The large number of firms engaged in industrial laundering and the relative ease with which new industrial laundries can be established makes it difficult for any one firm to dominate the market in which it operates. Thus, firms tend to be price takers, rather than price setters. This is particularly true in more densely populated urban and suburban areas, although even in rural markets it is likely that new industrial laundries will be established to compete with existing facilities if there are profits to be made. The fact that there are generally several facilities owned by several firms in any market[43] seems to support this conclusion.

The initial capital investments required to establish a new industrial laundry are relatively low, and there are no natural barriers to entering the industrial laundries market. A typical small, single-facility firm can currently be established with a relatively small capital investment and relatively unskilled labor.[44] Furthermore, facilities in related industries (i.e., engaged in other types of laundering) can be readily converted to industrial laundries because they possess some (if not all) of the necessary equipment, as well as general knowledge of the necessary skills. As their customer base and revenues have declined, for example, linen suppliers (SIC 7213) have begun offering industrial laundry products and supplies.[45]

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[42] 1996. "Association poised to meet industry's operational challenges." *Industrial Launderer. Op. cit.*

[43] IIL, 1989. *Op. cit.*

[44] According to Section 308 Survey data, single-facility firms that began operation during the survey timeframe (1991, 1992, and 1993) were estimated to have started up with a median capital investment of approximately $81,000 (measured as total assets). The range of capital investments reported by these facilities was $58,000 to $1.8 million per facility. Thus it appears that most laundry facilities can be established with a capital investment of substantially less than $1 million.

[45] IIL, 1989. *Op. cit.*

The increase in the number of large, multifacility firms in the industry (described in Section 3.3.1) does not appear to have had a significant impact on the overall competitive structure of the industry, although some local markets are more affected than others. In theory, large multifacility operations have the potential to gain a competitive edge over independent launderers because they have more resources and greater access to capital markets and thus might be able to use price pressure to increase market share. In addition, they could employ full-time professional marketing experts to try to attract customers, and they might be more able to withstand the shocks of changing market conditions and increased costs of adding environmental treatment technology. As discussed above, however, there do not appear to be major economies of scale in the industry, so cost reductions from consolidation are relatively small. In many circumstances, price competition, if it occurs, is financed by reductions in quality rather than by cost savings.[46] Moreover, multifacility firms still have to operate in local markets and typically have no advantages over small, single-facility firms with respect to knowing and being recognized in these markets. (In fact, a multifacility firm establishing a laundry in a new locality can even be at a slight disadvantage, particularly if it is building a customer base from scratch, rather than acquiring an existing facility with current accounts.) Thus, no evidence supports the conclusion that multifacility firms enjoy sufficient advantages or are large enough and few enough to dominate the industrial laundries market, on the aggregate level, through oligopolistic behavior.

Evidence of the lack of differentiation among industrial launderers can be found in the attitudes and behaviors of customers in selecting a rental uniform supplier. According to a 1996 UTSA study of how customers choose a uniform rental company, customers "do not regard the selection of a supplier as a high-risk decision," apparently because they perceive no significant differences among suppliers, particularly in terms of price.[47] Such attitudes are characteristic for customers in a competitive market. Individual firms and facilities are, nevertheless, attempting to improve quality and customer service as a means of differentiating themselves from their competitors. In addition, some industrial laundries have actively begun marketing add-on items such as continuous roll towels, air fresheners, and direct-sale mats to attract customers because they believe customers want the convenience of buying as much as possible from a single source.[48]

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[46] *Ibid.*

[47] Levite, Caryn Adair, 1996. "Getting there first is half the sale." *Industrial Launderer*. August, p. 30.

[48] Koepper, Ken, 1997. "1997: The year of the add-ons? Part 1." *Industrial Launderer*. January, pp. (continued...)

The observed behavior of individual firms in the industrial laundries industry also seems to confirm that industrial laundries markets are, on the whole, competitive. Profit margins are generally small (see Section 3.4.3), and there seem to be few opportunities for firms to earn and sustain large economic profits. Moreover, since the 1970s, revenue growth in the industry has been comfortable, but not outstanding, slightly outpacing GNP.[49,50] This pattern is consistent with theories of perfect competition, which predict that excessive profits in an industry entice new firms to enter the market and therefore will be quickly competed away. In most of the markets serviced by industrial laundries, profits are sufficient to keep firms from exiting, but are not attractive enough to encourage many new firms to enter. Small profit margins could also be a reflection of "predatory pricing" strategies, but, in this instance, profits are relatively small at nearly all firms and, as noted above, few opportunities exist for even multifacility firms to reduce costs per unit laundered. Industry experts note that the primary means by which firms can increase profits and remain competitive is to focus on improving productivity, service, and quality.[51,52]

3.3.2.2 Substitutes for Industrial Laundering

Although there are services and products that can be substituted for industrial laundering, substitutes do not currently pose a serious competitive threat to the industrial laundries industry, nor does EPA consider substitutability over small changes in price to be a major concern. Customers who rent uniforms could purchase garments outright and either establish onsite laundries or require employees to maintain their own garments. Onsite laundries often are not as efficient as industrial laundries, however, and individual workers, particularly those exposed to heavy-soil environments, might not have the equipment and chemicals needed to

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[48] (...continued)
21-22, 24. Also, Koepper, Ken, 1997. "1997: The year of the add-ons? Part 2." *Industrial Launderer.* February, pp. 16-18.

[49] 1994. "Strategic analysis of the textile rental industry: 1995." *Textile Rental.* October, pp. 26-28, 30, 32, 34, 36, 40, 42, 44, 46-47.

[50] IIL, 1989. *Op. cit.*

[51] 1996. "Association poised to meet industry's operational challenges." *Industrial Launderer. Op. cit.*

[52] 1995. "Strategic analysis of the textile rental industry: 1995." *Textile Rental. Op. cit.*

clean many stains at home.[53] Similarly, customers could purchase disposable shop towels and mops, but industrial laundries' products tend to be less costly, more durable, and more absorbent. In fact, for the printing industry, there are currently no real disposable alternatives to the reusable wiper towel; no disposables meet the industry's need for wipers that are both lint-free and highly absorbent.[54]

It is possible that disposables, particularly disposable shop towels (also known as "wipers"), might prove to be a competitive threat in the future, and, as such, they are regarded with concern by many industrial launderers.[55] To date, however, disposable shop towels have not been able to gain a significant foothold in the market because some states require that disposable textiles contaminated with hazardous soils be treated as hazardous wastes. As of the date of this report, EPA's current RCRA policy relies on EPA regions and states to determine how best to regulate solvent-contaminated reusable shop towels. Environmental regulations regarding solid waste reduction also increase the cost of using disposables because this cost includes not only the cost of the textile itself but also the cost of getting rid of it once it is soiled. At this time, therefore, few good substitutes for industrial laundering exist. (See Section Eight of this EA for a discussion of the potential for impact of the proposed IL Standards on price and thus on substitutability.)

EPA also has examined whether increased costs as a result of environmental regulation would create incentives for customers to establish onsite laundries. Because customers appear relatively insensitive to price increases, however, costs (and subsequent prices) would probably have to increase substantially for such a shift to occur. Furthermore, to establish onsite laundries, customers would have to purchase the equipment needed for processes such as textile cleaning, drying, sorting, and pressing. Companies would typically make such capital investments only if faced with large incremental increases in the cost of industrial laundering. As will be discussed in Appendix A, the average price increase likely to be associated with the proposed rule is estimated at approximately 0.3 cents per pound. It is unlikely that a cost increase of this magnitude will trigger a major shift toward substitutes. (See Section Eight for a more detailed discussion of this subject.)

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[53] U.S. EPA. 1989. *Preliminary Data Summary for Industrial Laundries. Op. cit.*

[54] 1997. "Wiper market watch: The view from EPA." *Industrial Launderer*. February, pp. 61-63.

[55] Dunlap, David D., and Mary Anne Dolbeare, 1996. "Wiper marketing challenges mount." *Industrial Launderer*. December, pp. 25-26, 30.

Nevertheless, major changes in laundering costs or in regulations regarding the treatment and handling of hazardous substances on cloth and disposable wipers might have implications for whether disposable products will be competitive substitutes for industrial laundering services in the future.[56] An industry study of the industrial wiper market[57] found that cloth shop towels are more economical than paper wipers, except for extremely dirty tasks requiring only one paper wiper. For cleaner tasks, cloth towels can be used multiple times before laundering and can be laundered fifteen to twenty times before being disposed of.[58] Thus, changes in the price of industrial laundering could reduce the economic advantages of using cloth shop towels instead of paper in high-soil situations, but only if the price increases substantially.

Industry sources also are concerned that excessive price competition at the expense of quality might reduce the appeal of industrially laundered goods. This is of particular concern when image, rather than functionality, is the basis for customers' interest in items such as uniforms and mats. (Shop towels tend to be differentiated more on price than quality.[59]) Thus, substitute products and services could become more important in the future as changes occur in the industrial laundries customer base and in the costs and quality of the services industrial laundries provide.

3.3.2.3 Customers and the Demand for Industrial Laundering Services

As discussed earlier, industrial laundries meet customers' needs for clean work apparel, clean work materials, and clean work environments. In other words, industrial laundering services are intermediate goods, or inputs in the production of final goods or services. Although there certainly is variation among industrial laundries' customers, the cost of laundering is most likely small relative to the cost of other inputs. See Section Eight of this EA for a detailed discussion of operating costs for major industrial laundry customers.

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[56] Hobson, David F, 1996. "Wipers continue to be UTSA focus." *Industrial Launderer*. October, p. 114.

[57] Mullen, Jocelyn, and Carl Lehrburger, 1991. *A Solid Waste And Laundering Assessment of Selected Reusable and Disposable Products*. Report to the Textile Rental Services Association of America, Hallendale, FL, and the Institute of Industrial Launderers, Washington, DC.

[58] IIL, 1988. *An Analysis of the Industrial Wiper Market*. Washington, DC:IIL.

[59] IIL, 1989. *Op. cit.*

Given the purposes for which customers purchase industrial laundries' products and services and the lack of real substitutes for these services (discussed above), the demand for industrial laundering appears to be relatively inelastic (i.e., the quantity of services and products demanded does not change substantially when price changes). Appendix A provides a more detailed description of the demand for industrial laundering, as well as calculations of elasticity based on Section 308 Survey data and historical output and price data. As Appendix A shows, demand, with an elasticity of -0.593, is estimated to be somewhat inelastic.

3.3.3 Growth and the Industry's Trajectory

Industry sources and investment analysts generally describe the industrial laundries industry as "healthy."[60,61,62] On average, industry revenue growth exceeds inflation, and most launderers receive a small but "comfortable" profit level.[63] Between 1982 and 1992, for example, revenues for SIC 721 (Laundry, Cleaning, and Shoe Repair), which encompasses almost all industrial laundering facilities as well as linen suppliers and dry cleaners increased at an average rate of 4.1 percent per year (adjusted for inflation). Revenue data from the Section 308 Survey is consistent with this pattern; revenue for the estimated 1,747 facilities engaged in industrial laundering activities grew an average real rate of 4.2 percent per year between 1991 and 1993. Such growth reflects the influence of a variety of factors, including the expansion of existing customer accounts, increased efforts at marketing and the broadening of the customer base in nontraditional markets, gains in productivity, and the adoption of new technology.

Since the size of the customer base and the resulting volume of textiles processed factor heavily into the profitability of industrial laundries, the future growth of the industrial laundries industry depends largely on the growth of current and potential customer industries. Because of the wide variety of customers serviced by industrial launderers, no one class of customers serves as the bellwether for the industrial laundries

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[60] Hobson, David F., 1996. "Wipers continue to be UTSA focus." *Industrial Launderer. Op. cit.*

[61] Paris, Alexander, Jr, 1994. *Op. cit.*

[62] 1996. "Investment analyst sees healthy '96 for uniform rental with internal growth and acquisitions." *Industrial Launderer. Op. cit.*

[63] Hobson, David F., 1996. "Wipers continue to be UTSA focus." *Industrial Launderer. Op. cit.*

industry. There are some signs that suggest that the rate of growth in the industry might slow somewhat in the near-term. The rate of job growth among all industries nationwide has slowed to approximately 1.5 percent in the 1990s (in comparison to the 2.0 to 2.5 percent growth seen during the "boom years" of the previous decade[64]), and garment rental in the heavy soil industries has declined.[65]

Nevertheless, aggressive marketing to the light-soil service and retail businesses have offset some of the declines in the heavy-soil market to date. Data from the Department of Commerce, moreover, suggest that job growth in many of the primary customer industries for industrial laundering — particularly the services industries — is likely to exceed average job growth nationwide (see Table 3-6). Job growth serves as an indicator of the health of the customer industry and represents a possible opportunity for increased sales of uniforms and other products.

In general, industry analysts note that the potential market for industrial laundries' services is several times greater than the current market.[66,67,68] The growth of the service economy, for example, offers opportunities for industrial launderers to further develop the image- and identity-oriented side of their businesses. In fact, laundries that adopt formal door-to-door sales strategies, as opposed to relying on an ad hoc sales and marketing staff, find their expansion limited more by internal resource constraints than by an inability to attract customers.[69] Industrial launderers also can expand their businesses by pursuing rental contracts with the large number of employers who currently maintain onsite laundries or who require employees to clean their own work uniforms.[70]

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[64] 1996. "Regional trend analysis shows pockets of potential." *Industrial Launderer. Op. cit.*

[65] IIL, 1989. *Op. cit.*

[66] Paris, Alexander, Jr., 1994. *Op. cit.*

[67] 1996. "Association poised to meet industry's operational challenge." *Industrial Launderer. Op. cit.*

[68] 1996. "IL interview: Bob Vieno." *Industrial Launderer.* September, pp. 41-42, 46.

[69] *Ibid.*

[70] Paris, Alexander, Jr., 1994. *Op. cit.*

Table 3-6

Actual 1994 Employment and Projected 2005 Employment in the Top Customer Industries For Industrial Landerers in 1995*

(in thousands)

Major SIC Group	Title	Employment (000) 1994**	2005***	Percent Change
55	Automotive Dealers & Service Stations	2,153	2,252	5%
75	Auto Repair, Services, and Parking	971	1,345	39%
58	Eating and Drinking Places	7,069	8,089	14%
54	Food Stores	3,289	3,930	19%
17	Special Trade Contractors	3,073	3,437	12%
50, 51	Wholesale Trade -- Durable and Nondurable Goods	6,140	6,559	7%
35	Industrial Machinery and Equipment	1,985	1,769	-11%
27	Printing and Publishing	1,542	1,627	6%
73	Business Services	6,239	10,032	61%
20	Food and Kindred Products	1,680	1,696	1%
80	Health Services	10,082	13,165	31%
34	Fabricated Metal Products	1,387	1,181	-15%
82	Educational Services	10,187	12,400	22%
59	Miscellaneous Retail	2,560	3,012	18%

* Data reflects all employees.
** Employment data from 1994 presented because 1994 data was used to project 2005 employment.
*** Projected employment in 2005 based on moderate growth assumptions.

Source: U.S. Department of Labor, 1997. "Employment by industry and occupation, 1994 and projected 2005 alternatives. Total, all occupations." Bureau of Labor Statistics (BLS), Office of Employment Projections.

3.4 INDUSTRY DEMOGRAPHICS

3.4.1 All Industrial Laundry Facilities

The 1,747 facilities engaged in industrial laundering in the United States vary significantly with respect to the types and volume of items they clean, the amount of wastewater they generate, the number of people they employ, and the revenues they earn, among other characteristics. As a result, it is not possible to describe a "typical" industrial laundry. This section therefore discusses the range of industrial laundry facilities found in the Section 308 Survey database.

3.4.1.1 Types and Volume of Items Laundered

According to Section 308 Survey data, the total volume of textiles laundered annually by all industrial laundries is approximately 9.4 billion pounds, with the average industrial laundry processing 5.4 million pounds annually. However, volumes processed range widely from facility to facility, as illustrated by Table 3-7. Approximately 2 percent of industrial laundry facilities are quite small and wash less than 300,000 pounds of textiles per year. An additional 7 percent launder between 300,000 and 1,000,000 pounds per year. On the other extreme, 36 percent of facilities launder more than 5 million pounds per year.

Approximately 51 percent of the total volume of items washed by the 1,747 industrial laundry facilities are industrial textiles. Nonindustrial textiles such as linens, flatwork, and health care items account for the remaining 49 percent. These data reflect the fact that linen supply firms cross over into industrial laundering activities and vice versa, as well as the fact that facilities primarily engaged in linen supply activities are considered industrial laundries under the regulation if they launder even small quantities of industrial items. As Table 3-8 indicates, facilities handling 1 million pounds of textiles or more per year account for almost all (99 percent) of total annual industry production.

Table 3-7

Number of Facilities by Annual Production

Annual Production	Number of Facilities	Percent of Facilities	Total lbs Laundered Annually by Group
Less than 1,000,000 lbs	167	10%	76,386,023
>=1,000,000 lbs and <2,000,000 lbs	264	15%	376,713,085
>=2,000,000 lbs and <3,000,000 lbs	211	12%	508,879,534
>=3,000,000 lbs and <4,000,000 lbs	231	13%	806,697,157
>=4,000,000 lbs and <5,000,000 lbs	254	15%	1,152,448,718
>=5,000,000 lbs and <6,000,000 lbs	144	8%	784,269,443
>=6,000,000 lbs and <7,000,000 lbs	116	7%	754,574,370
>=7,000,000 lbs and <10,000,000 lbs	116	7%	937,639,671
10,000,000 lbs or greater	245	14%	3,960,935,763
Total Number of Facilities	**1,747**	**100%**	**9,358,543,764**

Source: Section 308 Survey.

Table 3-8

Volume of Textiles Laundered by Industrial Laundries, by Type of Textile and Production Group

Textile Type	Annual Production at the Facility Level				Total Annual Industry Production
	Less than 1 million lbs		1 million lbs or greater		
	lbs laundered	% of total vol.	lbs laundered	% of total vol.	
Industrial Garments	6,911,593	0.30%	2,282,802,624	99.70%	2,289,714,217
Shop Towels and Printer Towels	24,186,721	5.02%	457,258,414	94.98%	481,445,135
Floor Mats	7,029,910	0.39%	1,796,974,890	99.61%	1,804,004,800
Mops, Dust Cloths, and Tool Covers	1,622,980	1.30%	122,998,088	98.70%	124,621,068
Fender Covers	14,784	0.04%	36,044,709	99.96%	36,059,493
Clean Room Garments	4,929,126	29.59%	11,729,595	70.41%	16,658,721
Other Industrial Textiles*	37,255	0.85%	4,355,905	99.15%	4,393,160
Total Industrial Textiles	***44,732,370***	***0.94%***	***4,712,164,226***	***99.06%***	***4,756,896,595***
Linen Supply Garments	441,930	0.16%	273,996,866	99.84%	274,438,796
Flatwork/Fulldry	21,474,561	0.65%	3,277,523,870	99.35%	3,298,998,431
Health Care Items	5,986,931	0.81%	731,770,997	99.19%	737,757,928
Continuous Roll Towels	117,978	0.10%	117,707,097	99.90%	117,825,075
Other Non-Industrial Textiles**	3,632,253	2.10%	168,994,683	97.90%	172,626,936
Total Non-Industrial Textiles	***31,653,654***	***0.69%***	***4,569,993,514***	***99.31%***	***4,601,647,167***
Total lbs. Laundered	**76,386,023**	**0.82%**	**9,282,157,739**	**99.18%**	**9,358,543,763**

* Includes laundry bags, filters, buffing pads, and other industrial items.
** Includes family laundry, absorbents, new items, and executive wear.

Source: Section 308 Survey (based only on facilities for which there is sufficient information).

3.4.1.2 Wastewater Generated

The quantity, or flow, of wastewater generated by industrial laundering activities is related to the volume and types of items laundered, the soils contained in these items, and the water conservation measures employed by each individual facility. As such, flow, like textile production volume, also ranges from facility to facility. Table 3-9 presents a breakdown of industrial laundering facilities by flow. The average flow volume for industrial laundries is 13.9 million gallons per year of wastewater. Flow rates from facilities range from 148,000 gallons per year to 204,500,000 gallons per year. Note that flow should not be interpreted as a complete description of the industrial laundries effluent stream because it is calculated simply on the basis of the volume of water produced, and not the concentration of pollutants.

3.4.1.3 Employment

An estimated 128,048 people are employed in industrial laundry facilities in the United States, according to Section 308 Survey data. Although 19,766 of these people (15 percent) are engaged primarily in management and administration, most are production employees. Production employees, as discussed earlier in Section 3.2.2.2, are typically unskilled or semiskilled laborers.

Approximately 20 percent of all industrial laundry facilities have 30 employees or fewer; as indicated in Table 3-10, almost all of these small facilities (85 percent) are single-facility firms.[71] At the other end of the scale, only 1 percent of industrial laundries employ more than 200 workers. The average number of employees per facility is 73; of these, 62 are production employees and 11 are in management and administration.

Facilities with 30 employees or fewer, on average, handle fewer pounds of textiles per employee, at higher costs per pound, than facilities with more than 30 employees. This difference suggests that there might be slight economies of scale in industrial laundering. Production volumes and costs vary widely, however, particularly at facilities with more than 30 employees. Thus, any economies of scale that exist do not appear

[71] The Small Business Administration (SBA) defines "small" on the basis of revenues. This breakdown between small and large will be discussed in detail in Section Nine.

Table 3-9

Number of Facilities by Annual Flow

Annual Flow	Number of Facilities	Percent of Facilities	Total Annual Flow by Group (gals/yr)	Percent of Total Flow by Group
Less than 1,000,000 gallons/year	32	2%	8,196,303	0.03%
>=1,000,000 and <5,000,000 gallons/year	318	18%	1,068,764,447	4.41%
>=5,000,000 and <10,000,000 gallons/year	471	27%	3,353,564,121	13.84%
>=10,000,000 and <20,000,000 gallons/year	502	29%	6,890,983,819	28.44%
>=20,000,000 and <30,000,000 gallons/year	244	14%	5,558,530,911	22.94%
>=30,000,000 gallons/year	181	10%	7,351,249,874	30.34%
Total Number of Facilities	1,747		24,231,289,475	

Source: Section 308 Survey.

Table 3-10

Number of Facilities by Employment Group

Number of Employees	Nonindependent Facilities		Single Facilities		All Facilities	
	Number	Percent	Number	Percent	Number	Percent
Less than 10	0	0%	39	5%	39	2%
>=10 and <30	53	6%	263	32%	316	18%
>=30 and <65	242	26%	249	30%	491	28%
>=65 and <100	374	41%	209	25%	583	33%
>=100 and <200	232	25%	63	8%	296	17%
200 or more	16	2%	6	1%	23	1%
Total Number of Facilities	917		830		1,747	

Source: Section 308 Survey.

to be substantial, although the statistical significance of the variation in costs by facility size has not been tested.

Consistent with there being no substantial economies of scale and with the labor-intensity of industrial laundering, the average number of workers employed at the facility level increases with production volume (i.e., facilities processing more textiles require more employees) (see Table 3-11).

3.4.1.4 Operating Costs and Revenues

Given the production and size variations discussed above, it is not surprising that industrial laundries' operating costs and revenues also span a wide range. Table 3-12 provides a breakdown of nonindependent facilities (those belonging to multifacility firms) and single facilities (those belonging to single-facility firms) by revenue group. To calculate the median operating costs and revenues for each group, EPA used Section 308 Survey data on individual facilities' and firms' operating costs and revenues. For each individual facility and firm, EPA estimated operating costs and revenues by averaging 3 years of survey data (1991, 1992, and 1993) in 1993 dollars. (Financial data in this EA are reported in 1993 dollars unless otherwise noted.)

The average industrial laundry facility has revenues of $4.3 million in 1993 dollars. On the whole, nonindependent facilities, which are part of larger multifacility firms, are slightly larger than single-facility firms in terms of both operating costs and revenues; average revenues for nonindependent facilities were $5.0 million, while average revenues for single-facility firms were $3.4 million. This reflects the fact that, on average, nonindependent facilities handle higher production volumes than single-facility firms. Moreover, the facilities that handle very small volumes of textiles (under 500,000 pounds annually) are all single-facility firms. Nevertheless, average costs and revenues for facilities handling approximately the same volume of textiles are relatively similar (see Table 3-13).

Multifacility firms also provided EPA with information on receipts at the owner-company level. Table 3-14 provides a breakdown of these firms by revenue group. Mean revenues are calculated using each firm's 3-year average in the same manner as that described above. For the single-facility firms, firm-level numbers are the same as the facility-level numbers in Table 3-12.

Table 3-11

Average and Total Number of Employees for Facilities In Each Production Group

	Annual Production at the Facility Level			
	Less than 1 million lbs	>=1 million lbs but <5 million lbs	5 million lbs or more	All Facilities
Production Employees				
Average number of employees per facility	14	44	103	62
Total number of employees	2,394	42,040	63,848	108,282
Management and Administration Employees				
Average number of employees per facility	6	9	16	11
Total number of employees	1,037	8,797	9,932	19,766
All Employees				
Average number of employees per facility	21	53	119	73
Total number of employees	3,431	50,838	73,780	128,048

Source: Section 308 Survey.

Table 3-12

Number of Nonindependent and Single Facilities, Average Revenues, and Average Operating Costs for Each Revenue Group (1993 $)

Revenue Group	Number of Facilities	Average Annual Revenues per Facility*	Average Annual Operating Costs per Facility*	Avg. Operating Costs as a % of Revenue**
		Nonindependent Facilities		
<$1 Million	47	$713,473	$740,604	107%
>=$1 Million and <$3.5 Million	257	$2,165,290	$1,750,122	81%
>=$3.5 Million and <$7 Million	410	$4,846,980	$4,377,257	90%
>=$7 Million and <$10.5 Million	156	$9,179,807	$8,039,859	88%
>=$10.5 Million	47	$12,909,232	$11,269,148	87%
All Nonindependent Facilities	917	$5,037,796	$4,434,235	88%
		Single Facilities		
<$1 Million	182	$636,258	$601,073	97%
>=$1 Million and <$3.5 Million	292	$2,036,557	$1,777,440	90%
>=$3.5 Million and <$7 Million	258	$4,719,935	$4,305,133	92%
>=$7 Million and <$10.5 Million	81	$8,171,814	$7,211,935	88%
>=$10.5 Million	18	$15,416,262	$13,416,214	87%
All Single Facilities	830	$3,443,624	$3,080,149	92%
		All Facilities		
<$1 Million	228	$651,987	$629,496	99%
>=$1 Million and <$3.5 Million	549	$2,096,840	$1,764,648	86%
>=$3.5 Million and <$7 Million	668	$4,797,930	$4,349,411	91%
>=$7 Million and <$10.5 Million	237	$8,836,064	$7,757,522	88%
>=$10.5 Million	65	$13,589,341	$11,851,605	87%
All facilities	1,747	$4,280,361	$3,790,872	90%

* Figures in 1993 $ based on average revenues and average costs over the three years from 1991 to 1993.

** Average of ratios calculated on a per-facility basis. Does not reflect relationship between average revenues and costs as reported in this table because these figures may not be based on the same average facility. Figures above 100% reflect the fact that facility costs and revenues are calculated based on a 3-year average. For some facilities, revenues exceeded costs in each of the 3 years covered by the Survey, but costs exceeded revenues on average.

Source: Section 308 Survey.

Table 3-13

Average and Total Revenues and Operating Costs for Facilities in Each Production Group (1993 $)

	Annual Production at the Facility Level			**All Facilities**
	Less than 1 million lbs	**>=1 million lbs but <5 million lbs**	**5 million lbs or more**	
Nonindependent Facilities				
Average revenue per facility*	$1,268,916	$3,281,432	$6,909,441	$5,037,796
Average operating costs per facility*	$1,234,021	$2,829,663	$6,125,213	$4,434,235
Number of nonindependent facilities	36	417	464	917
Single Facilities				
Average revenue per facility*	$999,020	$3,029,328	$6,915,453	$3,443,624
Average operating costs per facility*	$977,181	$2,635,831	$6,371,593	$3,080,149
Number of nonindependent facilities	130	543	157	830

* Figures in 1993 $ based on average revenues and average costs over the 3 years from 1991 to 1993.

Source: Section 308 Survey.

Table 3-14

Number of Multifacility Firms and Average Revenues for Each Revenue Group (1993 $)

Revenue Group	Number of Firms	Average Annual Revenues per Firm
<$3.5 Million**	7	$1,038,204
>=$3.5 Million and <$7 Million	8	$4,644,041
>=$7 Million and <$10.5 Million	10	$8,501,095
>=$10.5 Million	48	$319,648,406
All Multifacility Firms	**73**	**$212,458,713**

* Figures in 1993 $ based on average revenues and average costs over the 3 years from 1991 to 1993.
** Firms in the <$1 million revenue group were combined with firms in the >+$1 million and <$3.5 million group to protect confidentiality.

Source: Section 308 Survey.

Based on firm-level revenues, 812 single-facility firms (97.8 percent of all single-facility firms) and 25 multifacility firms (34 percent of all multifacility firms) meet the definition of "small" used by EPA and SBA to classify small businesses under the Small Business Regulatory Flexibility Act (SBREFA),[72] for a total of 837 small businesses, or 92.7 percent of all firms.

Although the Section 308 Survey gathered information on revenues earned at the facility- and firm-level from the laundering of industrial and nonindustrial textiles, as well as the percentage of total revenues earned from laundering the various types of textile items, EPA found that responses to these questions were not always reliable nor consistent with the definitions of "industrial" and "nonindustrial" used in the proposed IL Standards. The data on revenues by types of textiles laundered therefore are not presented in this EA.

3.4.1.5 Price

Revenues in the industrial laundries industry really cannot be calculated with reference to a single per-unit price. Instead, in developing a pricing strategy, a laundry generally takes into consideration a variety of factors, including the original cost of the textile rented or sold, the lifetime of the textile (if rented), and the cost and frequency of required maintenance.[73] Uniforms, for example, often are priced on a "per wearer" basis, which incorporates specific assumptions about the number of changes required per week. The average weekly revenue per uniform wearer for industrial laundries in 1992 was approximately $6.14.[74] For shop towels, prices per shop towel range from under 2½ cents to over 8 cents, again reflecting the absence of any standard industry pricing pattern.[75]

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[72] According to the SBA, firms in SIC 7211, 7213, and 7218 are "small" if they have under $10.0 million (SIC 7218) or $10.5 million (SIC 7213 and 7211) in annual revenues. EPA uses the $10.5 million cutoff for the purposes of this analysis.

[73] Antonelli, Joe, 1996. "Getting to know your uniform costs." *Industrial Launderer*. July, pp. 47-48, 50, 52.

[74] IIL, 1993. *Op. cit.* In the absence of price data, revenue is assumed to be a proxy for price.

[75] IIL, 1988. *An Analysis Of The Industrial Wiper Market. Op. cit.*

Customers that purchase laundering services in large quantities (e.g. uniforms for an entire company) may be offered bulk discount prices or add-on services (such as laundering of rented mats) at no additional charge. About half of the users of rental shop towels, for example, also receive uniforms from their suppliers. For such customers, shop towels and other peripheral items may be priced to undercut competitors as part of a strategy to attract and retain uniform rental accounts because the uniform rental business tends to be extremely competitive and price sensitive.[76]

3.4.2 Industrial Laundry Facilities With Less Than 1 Million Pounds of Production per Year

Table 3-15 highlights the fact that, as a group, facilities that handle less than 1 million pounds of textiles per year have a rather different profile from larger laundries. Small facilities generate smaller profits and substantially less wastewater on an individual facility basis. Baseline pollutant loadings from these facilities, moreover, account for a small percentage of the overall industry loadings, although the effluent of small facilities that handle shop towels or printer towels/rags can contain a relatively high concentration of toxic contaminants. As a result, except for facilities laundering shop towels or printer towels/rags, the adverse economic impacts of the proposed IL Standards would generally be quite high relative to the rest of the industrial laundry category. In addition, these small facilities have fairly small pollutant removals compared to the category as a whole (see the preamble to the proposed rule for a more detailed discussion of this subject).

3.4.2.1 Exclusion of Facilities With Less Than 1 Million Pounds of Production Per Year That Also Launder Less than 255,000 Pounds of Shop Towels

In recognition of the differences between small and large facilities, EPA is proposing that the IL Standards would apply primarily to the portion of the industry laundering 1 million pounds of textiles or more per calendar year, for existing facilities.[77] Existing facilities laundering less than 1 million pounds per calendar year would be excluded from the proposed rule, provided that they launder no more than 255,000

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[76] *Ibid.*

[77] The "small" facilities referred to here are only those laundering less than 1 million pounds of textiles per year.

Table 3-15

Comparison of Facilities with Less than 1 Million Pounds Production per Year and Facilities With More Than 1 Million Pounds Production per Year

Facility Characteristics	Annual Production at the Facility Level: Less than 1 million lbs	Annual Production at the Facility Level: 1 million lbs or greater
Average Flow Rate (gallons per year)	2,354,852	15,080,639
Average Number of Employees	21	79
Average Revenues (1993 $)*	$1,057,554	$4,619,946
Average Operating Costs (1993 $)*	$1,032,884	$4,081,479

* Figures in 1993 $ based on average revenues and average costs over the 3 years from 1991 to 1993.

Source: Section 308 Survey.

pounds of shop and printer towels/rags annually. Approximately 8 percent of the facilities that otherwise meet EPA's definition of an industrial laundry (141 out of 1,747) are eligible for exclusion. All the excluded facilities are small entities under the Small Business Administration (SBA) definition of small entity. EPA's rationale for excluding these facilities is discussed in more detail in the preamble and Appendix E of this EA. New facilities would not be entitled to this exclusion.

3.4.3 Financial Conditions at the Firm Level

As mentioned earlier, there are 903 industrial laundry firms associated with 1,747 industrial laundry facilities through five general chains of ownership (identified as A, B, C, D and E in the Section 308 Survey) in the United States. Seventy-three of these firms (those linked to A, B, and D facilities) maintain financial records for multiple laundering facilities. The remaining 830 firms (those linked to C and E facilities) are associated with single facilities. Firms with A, B, and C facility ownership patterns also are associated with an ultimate parent company.

A variety of organizational structures can be found in each ownership grouping. Although most industrial laundries are structured as standard corporations, which results in the corporation paying corporate income tax, approximately 382 of the 903 industrial laundry firms (42 percent) are S corporations,[78] limited partnerships, and sole proprietorships, which are taxed at the owner-level (at rates for individual taxpayers), rather than at the firm-level. With the exception of an estimated 10 owner firms of type-D facilities, most of the S corporations are single-facility (CE) firms. Most industrial laundries are privately held, but some of the larger multifacility firms are publicly held.

As noted earlier, to examine the firm-level impacts of the proposed standards, EPA grouped industrial laundries into two categories on the basis of ownership category; ABD multifacility firms are analyzed separately from CE single-facility firms. Data for these analyses were taken from the Section 308 Survey database.

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[78] S corporations are firms that have elected to be taxed at the shareholder level, rather than at the corporate level, under Subchapter S of the Internal Revenue Code.

Table 3-16 presents average baseline summary financial data on the firms in the industrial laundry industry. Since financial conditions at multifacility firms reflect the aggregate conditions at several facilities, multifacility firms typically earn more revenue and have greater assets and financial resources than single-facility firms. This is not always true of multifacility and single-facility firms within each revenue group; earnings at single-facility firms are higher than those at multifacility firms in the \$3.5 million to \$7 million and the \$7 million to \$10.5 million revenue groups, for example. However, the average ratio of earnings before interest and taxes (EBIT) to revenues (which is used as a proxy for profit margin) is higher at multifacility firms than at single-facility firms in all revenue groups.[79]

Possible differences between the two types of firms with respect to financing capital investments are reflected in the fact that, in some revenue groups, single-facility firms have higher average total assets and owner equity, while multifacility firms have higher average total liabilities.

The baseline and postcompliance financial health of firms in the industrial laundries industry is discussed in greater detail in Section Six. Postcompliance impacts are calculated relative to baseline financial conditions.

[79] Note, however, despite slim profit margins, returns on investment in small firms are reasonable, due to the small investment required to start up and operate a laundry (see discussion in Section Nine of this EA and Table 9-1).

Table 3-16

Number of Firms and Average Financial Measures for Each Revenue Group (1993 $)

Revenue Group	Number of Firms	Earnings Before Interest and Taxes	Working Capital	Total Assets	Total Liabilities	Owner Equity*	Ratio of Earnings to Revenues**
Multifacility Firms							
<$3.5 Million***	7	$338,244	$546,696	$1,135,711	$714,855	$420,857	0.1353
>=$3.5 Million and <$7 Million	8	$200,027	$1,028,953	$2,317,731	$1,050,920	$1,265,441	0.0258
>=$7 Million and <$10.5 Million	10	$669,794	$1,795,676	$5,717,464	$2,430,647	$3,286,817	0.0470
>=$10.5 Million****	48	$11,365,961	$17,697,501	$81,211,283	$26,800,090	$54,411,216	0.0464
All Multifacility Firms****	73	$7,549,274	$11,945,014	$54,054,702	$17,979,079	$36,075,479	0.0524
Single-Facility Firms							
<$1 Million	182	$2,462	$525	$238,852	$199,406	$25,056	0.0008
>=$1 Million and <$3.5 Million	292	$91,310	$189,454	$827,992	$429,221	$403,588	0.0034
>=$3.5 Million and <$7 Million	258	$251,878	$560,027	$3,161,855	$903,575	$2,275,879	0.0031
>=$7 Million and <$10.5 Million	81	$1,032,098	$1,316,423	$13,077,679	$1,246,974	$11,887,875	0.0111
>=$10.5 Million	18	$2,129,316	$2,010,339	$20,246,504	$3,636,866	$16,609,638	0.0274
All Single-Facility Firms	830	$256,417	$411,362	$3,026,683	$673,781	$2,362,469	0.0040

* Owner equity is being used as a proxy for retained earnings in Altman Z" analyses of firm-level impacts.
** The ratio of earnings to revenues is a proxy for profit margin (or the ratio of earnings to sales), for comparison of multifacility and single-facility firms.
*** For multifacility firms, firms in the <$1 million revenue group were combined with firms in the >=$1 million and <$3.5 million group to protect confidentiality.
**** Two weighted firms that are statistical outliers were not included in the calculation of financial measures.

Source: Section 308 Survey.

SECTION FOUR

ECONOMIC IMPACT ANALYSIS METHODOLOGY OVERVIEW AND COMPLIANCE COST ANALYSIS

This section covers several components necessary for identifying and characterizing the potential impacts of regulatory compliance costs at the facility and owner-company levels and other potential secondary impacts. Section 4.1 provides an overview of the methodology used in analyzing the economic impact of the regulatory compliance costs. Section 4.2 discusses the cost annualization model, which is the fundamental component of this methodology. Section 4.3 summarizes the results calculated using this model (i.e., the total annualized cost of compliance for the industrial laundries industry as a whole for each of the regulatory options considered).

4.1 METHODOLOGY OVERVIEW

Together, the regulatory analyses presented in this EA offer a comprehensive assessment of economic impacts at all relevant levels of activity. Figure 4-1 shows how the four principal models used in the EA (the cost annualization model, the facility closure model, the owner company model, and the market model) relate to one another, the inputs required for these models, and the outputs they generate. At the heart of the EA is the cost annualization model, which uses facility-specific cost data and other inputs (from EPA's Development Document) to determine the annualized capital and operating and maintenance (O&M) costs of improved wastewater treatment. Annualized cost data feed into the facility analysis, which models the economic impacts of regulatory costs on individual industrial laundry facilities, irrespective of ownership. The firm-level analysis examines the possible effects of increased regulatory costs on companies that own multiple affected industrial laundry establishments and also gauges the ability of all firms to raise the capital necessary to purchase and install pollution control equipment. It also evaluates the ability of single-facility firms to raise the necessary capital to purchase and install pollution control, which is a different analysis from that determining whether a firm can afford to purchase, install, and operate the equipment. A firm might be able to cover the costs of pollution control, but be too weak financially to attract the capital to make the purchase. The market model estimates changes in market price and quantity due to increased facility regulatory costs. The EA then explores impacts on employment and other measures of community welfare.

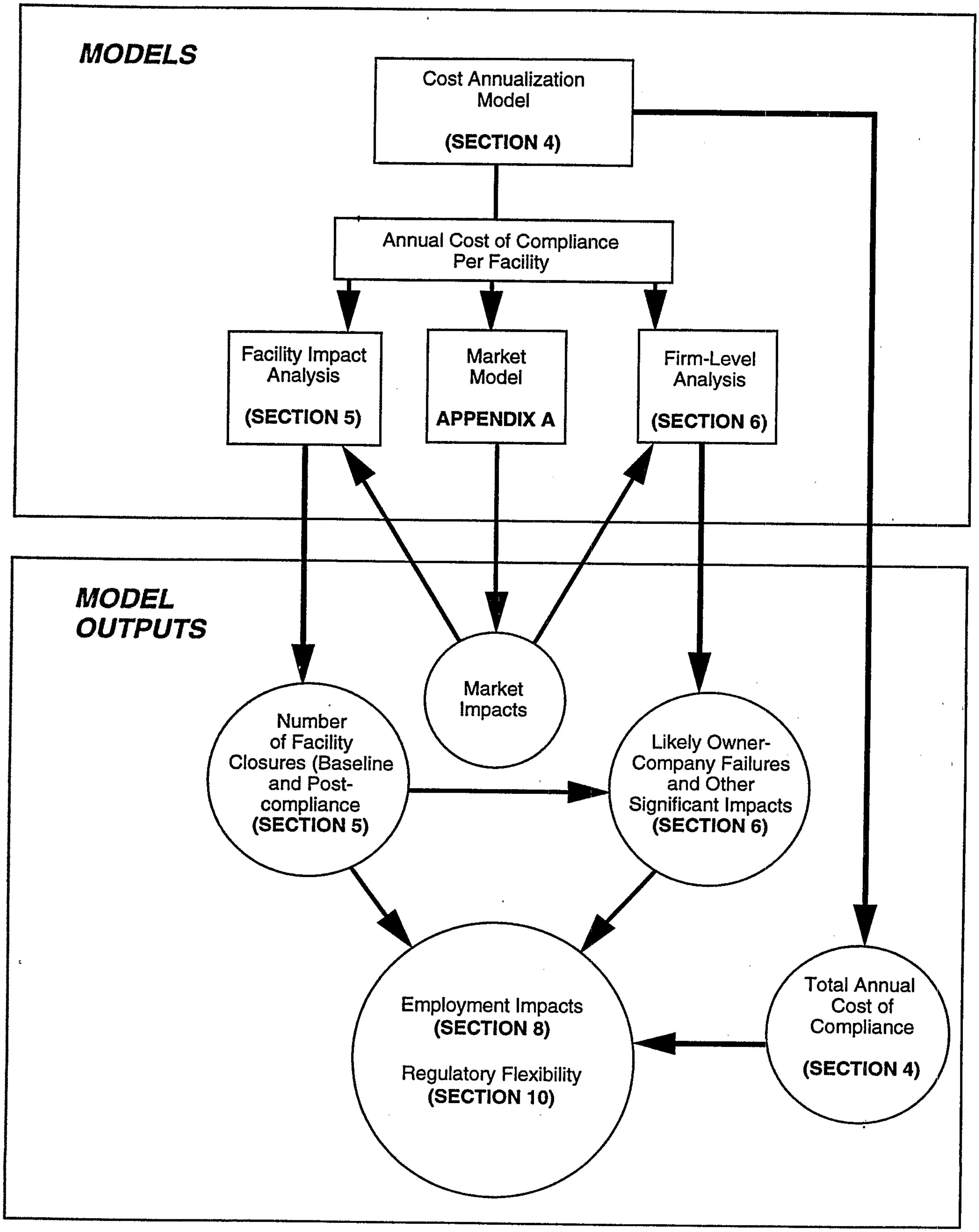

Figure 4-1. Relationships of the four principal models used in this economic analysis.

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Additional analyses examine whether increased compliance costs will affect domestic or international markets, customers, inflation, new sources, or small businesses.

4.2 COST ANNUALIZATION MODEL

4.2.1 Purpose of Cost Annualization

The cost annualization model estimates each facility's annual compliance cost on the basis of the costs required to purchase and operate new pollution control equipment for each technology option under consideration for the proposed IL Standards. Cost annualization calculations consider the changes in annual cash outflow for each facility due to pollution control expenditures, once the tax effects of these expenditures (e.g., depreciation tax shields) are taken into account. Pollution control expenditures can be divided between two components: the initial capital investment to purchase and install the equipment and the annual cost of operating and maintaining such equipment (O&M costs). Capital costs are a one-time expense incurred only with the acquisition of the equipment, while O&M costs are incurred every year of the equipment's operation. The engineering cost model used to estimate facility compliance costs defines both capital and O&M costs.[1]

To determine the economic feasibility of upgrading a facility, the costs of compliance must be compared to each facility's precompliance cash flow. Pollution control costs cannot be directly compared to first-year facility cash flow, however; the capital costs must be annualized, reflecting the fact that capital equipment costs are incurred only once and can be financed (i.e., spread out over the equipment's lifetime).

In the model, EPA calculates total annualized costs by allocating the capital investment over the lifetime of the equipment, using a cost-of-capital factor to address the costs associated with raising or borrowing money for this investment, and adding in annual O&M costs. The resulting annualized cost

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[1] Cost data are from EPA's Development Document.

represents the average annual payment a given company will need to make to upgrade its facility.[2] EPA investigates whether a firm can raise the capital to make the investment in the firm-level analysis.

4.2.2 Inputs, Assumptions, and Model Outputs

4.2.2.1 Regulatory Options

The engineering cost estimates that feed into the cost annualization model are based on a set of four regulatory options developed by EPA for Pretreatment Standards for Existing Sources (PSES). A fifth option, COMBO-IL2LIM, (see Table 4-1) was briefly investigated, but no impact analysis was performed. Costs of this option are similar and impacts are expected to be very close to those of the COMBO option. Impacts of Pretreatment Standards for New Sources (PSNS) are discussed in Section Five. EPA developed compliance costs for each facility in the Section 308 Survey database for each of the four regulatory options. EPA's Development Document presents the derivation of the engineering cost estimates, including capital and O&M costs, under each option. Table 4-1 presents the regulatory options addressed in this analysis and defines the technologies associated with each option. The four options are referred to in this document by their abbreviated names: OC, CP, COMBO, and DAF.[3] CP is the preferred option for the proposed rule.

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[2] The annualized cost is analogous to a mortgage payment, which spreads the one-time investment in a home into a series of continual monthly payments. An annualized cost approach also more closely reflects how companies report expenditures on pollution control equipment. This equipment must be capitalized, not expensed according to IRS requirements: The equipment can be depreciated, but the total cost of the equipment cannot be subtracted from income in the first year (Commerce Clearinghouse, Inc., 1995. *U.S. Master Tax Guide*, 1995; and Research Institute of America, Inc., 1995. *The Complete Internal Revenue Code* [Section 169]. New York, NY: Research Institute of American, Inc., January).

[3] The last three options correspond to CP-IL, COMBO-IL, and DAF-IL as presented in EPA's Development Document. Since all other options based on chemical precipitation, dissolved air flotation, or a combination of these two technologies were eliminated as viable alternatives (see the Development Document for discussions concerning the rejected options), EPA has shortened the option names for simplicity.

Table 4-1

The Regulatory Options

Option	**Description**
OC	Organics control using a steam-tumbling process.
CP	Chemical precipitation treatment of wastewater from industrial laundry items; linen wastewater does not require treatment. If untreated, the treated and untreated streams are combined prior to discharge.
COMBO*	Either chemical precipitation or dissolved air flotation of wastewater from industrial laundry items; linen wastewater does not require treatment. If untreated, streams are combined prior to discharge. Uses the higher long-term average of the two technologies.
DAF	Dissolved air flotation treatment of wastewater from industrial laundry items; linen wastewater does not require treatment. If untreated, streams are combined prior to discharge.

Note: CP, COMBO, and DAF correspond to CP-IL, COMBO-IL, and DAF-IL in EPA's Development Document; option names have been shortened here for simplicity.

*COMBO-IL2LIM, a variant on the COMBO option, also was investigated briefly. This option entails chemical precipitation or dissolved air flotation of wastewater from industrial laundry items; linen wastewater does not require treatment. Streams are combined prior to discharge. For facilities that have DAF in place, the DAF standards would apply and for all other facilities, CP standards would apply. As shown in the Development Document, costs are similar to those for COMBO; impacts should be similar to those associated with COMBO, and will not be less than those for CP.

4.2.2.2 The Cost Annualization Model Parameters

Table 4-2 presents the cost annualization model using assumed data for illustrative purposes. The inputs and assumptions for the analysis are listed above the spreadsheet. The first input is the *facility code* for the facility analyzed. The second line is the *type of corporate entity* (e.g., incorporated or other). The third line presents the regulatory *option* or alternative for which the annualized costs are calculated.[4] The fourth and fifth lines are the option's *capital* and *O&M* costs (from EPA's Development Document). For comparison purposes, costs are provided in terms of 1993 dollars.

The *life of the asset* is determined according to the Internal Revenue Code's classes of depreciable property. Fifteen-year property is assumed to have a class life of 20 to 25 years—a typical life span for the equipment considered in the costing analysis. According to the U.S. Master Tax Guide, 15-year property includes such assets as municipal wastewater treatment plants.[5] Thus, for the purposes of calculating depreciation, most components of the capital cost for a pollution control option would be considered 15-year property.[6]

The *discount rate* reflects the costs of capital for industrial laundry facilities and is used to calculate the present value of the cash flows. The discount rate used in the EA is based either on the actual cost of capital reported by each facility in the Section 308 Survey or, if these data are missing or suspect, on the mean and median discount rate (which both equal 10 percent) reported by the industrial laundry facilities in

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[4] The terms "option" and "alternative" are used interchangeably in this section.

[5] Commerce Clearinghouse, Inc., 1995. *U.S. Master Tax Guide.* p. 322.

[6] EPA investigated the sensitivity of the analysis to changes in depreciation schedules and life of property. Only changes in life of property have any measurable impact on annual costs, but life of property is unlikely to be less than 15 years; see Jeff Cotter and Anne Jones, ERG, 1997. "Sensitivity analysis of annualized cost estimates to changes in depreciation and project lifetime." Memorandum to Sue Burris, EPA. October 26.

Table 4-2
Sample Spreadsheet for Annualizing Costs

Inputs

Survey ID #:	XXXX
Option Number:	
Initial Capital Cost ($) (Line A):	$303,055
Annual O&M Cost ($) (Line B):	$68,256
Facility-Specific Nominal Discount/Interest Rate:	10.0%
Expected Inflation Rate:	2.9%
Real Discount Rate:	7.1%
Corporate Tax Structure:	1
Taxable Income ($):	$65,887,133
Marginal Income Tax Rates:	
Federal:	34.0%
State:	6.60%
Combined (Line C):	40.60%

1	2	3	4	5	6	7	8
Year	Depreciation Rate	Depreciation For Year (Line A*Col 2)	Tax Shield From Depreciation (Line C*Col 3)	O&M Cost (Line B)	O&M Tax Shield (Line C*Col 5)	Cash Outflow (Line A in Yr 1; Line B in Yrs 2-15)*	Cash Outflow After Tax Shields (Col 7-(Col 4+Col 6))
1	5.00%	$15,153	$6,152	$34,128	$13,856	$337,183	$317,175
2	9.50%	$28,790	$11,689	$68,256	$27,712	$68,256	$28,855
3	8.55%	$25,911	$10,520	$68,256	$27,712	$68,256	$30,024
4	7.70%	$23,335	$9,474	$68,256	$27,712	$68,256	$31,070
5	6.93%	$21,002	$8,527	$68,256	$27,712	$68,256	$32,017
6	6.23%	$18,880	$7,665	$68,256	$27,712	$68,256	$32,879
7	5.90%	$17,880	$7,259	$68,256	$27,712	$68,256	$33,285
8	5.90%	$17,880	$7,259	$68,256	$27,712	$68,256	$33,285
9	5.91%	$17,911	$7,272	$68,256	$27,712	$68,256	$33,272
10	5.90%	$17,880	$7,259	$68,256	$27,712	$68,256	$33,285
11	5.91%	$17,911	$7,272	$68,256	$27,712	$68,256	$33,272
12	5.90%	$17,880	$7,259	$68,256	$27,712	$68,256	$33,285
13	5.91%	$17,911	$7,272	$68,256	$27,712	$68,256	$33,272
14	5.90%	$17,880	$7,259	$68,256	$27,712	$68,256	$33,285
15	5.91%	$17,911	$7,272	$68,256	$27,712	$68,256	$33,272
16	2.95%	$8,940	$3,630	$34,128	$13,856	$34,128	$16,642
Sum	100.00%	$303,055	$123,040	$1,023,837	$415,678	$1,326,892	$788,174
Present Value		$198,702	$80,673	$640,228	$259,933	$943,283	$602,677

	After Tax Shield	Before Tax Shield
Present Value of Incremental Costs:	$602,677	$943,283
Annualized Cost:	$64,160	$100,421

Notes: This spreadsheet assumes that MACRS is used to depreciate capital expenditures.
Depreciation rates are from 1995 U.S. Master Tax Guide for 15-year property and mid-year convention.
Corporate Tax Structure: 1= corporate tax rate 2 = individual tax rate.
If the company-specific discount rate is <3% or >19%, then an industry median figure of 10.0% is used.
First year is not discounted.

*Plus 1/2 of Line B in years 1 and 16.

the Section 308 Survey.[7] All rates were adjusted for an inflation rate of approximately 3 percent, providing an average real discount rate of approximately 7 percent.[8]

The final model parameters are the federal and average state *tax rates*, which are used in determining each facility's tax benefit or tax shield. A facility is allowed to reduce its taxable income by the amount spent on incremental O&M costs and by the depreciable portion of its capital equipment.[9] The tax rates used in the model represent the marginal federal tax rate (the rate applied to corporate income above $335,000)[10] and the average state corporate income tax rate (see Appendix B). The average state tax rate is used in the cost annualization model because it can be unclear which state tax rates apply to a given facility's revenues. For example, a facility located in one state might be owned by a firm whose corporate headquarters is located in a second state and whose corporate holding company is located in a third.

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[7] EPA assigned a discount rate of 6 percent, the Federal Reserve prime rate for 1993, to facilities that reported a discount rate of "prime." EPA considered reported discount rates of less than 3 percent and more than 19 percent to be suspect. Discount rates in these ranges were dropped and replaced by the average of all other reported discount rates. Discount rates of less than 3 percent were thought to be too low because banks were charging a prime rate of nearly 6 percent and the Federal Reserve Bank of New York had instituted a discount rate of nearly 3 percent during the time of the Section 308 Survey effort. Prime and discount rate data are from Federal Reserve Statistics, 1994. *Public Statistical Release H-15.* Public Services, Board of Governors, Federal Reserve System, January 3. Similarly, discount rates of more than 19 percent were considered to represent a hurdle rate (the rate of return desired for a project before it will be undertaken), rather than a true discount rate.

[8] The inflation rate is based on changes in the Consumer Price Index between 1992 and 1994. U.S. Government Printing Office, 1996. *Economic Report of the President, 1996.* Washington, DC: U.S. Government Printing Office. February. Note that this discount rate is approximately the same as that recommended by OMB, undated. "Memorandum for members of the regulatory working group regarding economic analysis of federal regulations under Executive Order 12866." Sally Katzen.

[9] Commerce Clearinghouse, Inc., 1995. *U.S. Master Tax Guide*, p. 314.

[10] The cost annualization model uses the relevant marginal federal income tax rate based on taxable earnings, either for corporations or for individuals (if the firm is an S corporation or organized as another noncorporate structure).

4.2.2.3 The Cost Annualization Model Structure and Outputs

Two assumptions were made in annualizing compliance costs. The first assumption is that the facility owners will be using the Modified Accelerated Cost Recovery System (MACRS) to depreciate capital investments, which reduces the effective cost to the facility of purchasing and operating the pollution control equipment. The second is that a 6-month delay occurs between the purchase of pollution control equipment and its operation. The details of these assumptions and their impact on the results of the MACRS cost annualization model are presented in Appendix B.

In Table 4-2, the spreadsheet contains numbered columns in which the costs of the investment to the facility are calculated. The first column lists each year of the equipment's life span, from its installation through its 15-year depreciable lifetime.[11] Column 2 represents the portion of capital costs that can be written off or depreciated each year; these rates are based on MACRS, as shown in Appendix B. By multiplying these rates by the total capital cost, EPA calculates the annual amount the facility can depreciate (Column 3). These depreciable amounts are used by the firm to offset annual taxable income. Column 4 shows the tax benefit provided by the depreciation expense, (i.e., the overall tax rate times the depreciation amount for the year).

Column 5 of Table 4-2 shows the annual O&M expense. These costs are constant, except in Year 1 when only half the O&M costs are incurred because the equipment is not in service through half the year.[12] Column 6 shows the tax shield or benefit provided from expending the O&M costs. Column 7 lists the facility's total expenses associated with the additional pollution control equipment: EPA assumes that capital costs are incurred during the first year when the equipment is installed. The O&M expense is added to capital costs for all years except Year 1. Column 8 lists the annual cash outflow minus the tax shields from the O&M expenses and depreciation because the facility will recoup these costs as a result of reduced income taxes.

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[11] An asset's depreciable life can differ from its actual life. The pollution control equipment considered in this analysis is in the 15-year property class; however, the actual life could extend to 25 years. EPA's estimate of annualized costs is conservatively high as long as the equipment does not have to be replaced in its entirety (costs for replacement pumps and other equipment needed for maintenance have been included in O&M) in less than 16 years (see Appendix B).

[12] The 6-month delay between purchase and operation plus the 15 year life is actually 16 years because a mid-year convention is used to compute the annualized cost. A 6-month delay plus the mid-year convention means that the annualization formula does not begin discounting until the end of the first year.

Once the yearly cost to the facility has been determined, the yearly cost is transformed into a constant cost stream. The bottom line in Column 8 represents the present value of the costs over the equipment's life span. The annualized cost is calculated as the 16-year annuity (15 years plus one year)[13] that has the same present value as the bottom line in Column 8 of Table 4-2. The annualized cost represents the annual payment required to finance the capital outlay and pay for O&M after tax shields. In essence, paying the annualized cost every year and paying the amounts listed in Column 8 for each year are equivalent. In this example, the capital investment of $303 thousand and annual O&M cost of $68 thousand (1993 dollars) result in an annualized posttax cost of $64 thousand.[14] Figure 4-2 presents the equations used to calculate present value and annual cost.

The present value of the cost for incremental pollution control is used in the facility analysis (Section Five). Results of the calculation of aggregate compliance costs are presented below in Section 4.2.

4.3 TOTAL ANNUALIZED COMPLIANCE COSTS

EPA calculates total annualized compliance costs by aggregating the annualized compliance costs for all affected facilities, based on the output of the cost annualization model. Table 4-3 presents the results of this cost aggregation by regulatory option. Impacts on firms and facilities, which are discussed in other sections of this report, are calculated on the basis of these posttax costs (i.e., the costs as perceived by the affected firms and facilities after taxes are paid). Note that this table reflects the zero compliance costs assigned to facilities excluded from the rule (i.e., those existing facilities that launder less than 1 million pounds of incoming laundry per calendar year and less than 255,000 pounds of shop and/or printer towels/rags per calendar year), These excluded facilities are not counted when the average cost per facility is calculated. Thus the average cost per facility reflects the average to facilities that are not excluded.

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[13] See previous footnote on timing.

[14] Note that the annualized cost can be determined in two ways. The first way is to calculate the annualized cost as the difference between the annuity value of the cash flows (Column 7) and the tax shields (Columns 4 and 6). The second way is to calculate the annuity value of the cash flows after tax shields (Column 8). Both methods yield the same value.

$$\text{NET PRESENT VALUE} = v_1 + \sum_{i=2}^{n} \frac{v_1}{(1 + \text{int})^{i-1}}$$

where:

$v_1 .. v_a$	=	series of cash flows
int	=	interest rate
n	=	number of cash flow periods
i	=	current iteration

$$\text{ANNUALIZED PAYMENT} = \text{principle} \times \frac{\text{int}}{1 - (\text{int} + 1)^{-n}}$$

where:

int	=	periodic interest rate
n	=	term

Figure 4-2. Calculations used to compute present value.

Table 4-3

Compliance Costs for the Regulatory Options (1993 dollars)*

Option	Total Capital Costs	Total O&M Costs	Total Posttax Annualized Costs	Average Annual Posttax Cost per Facility
OC	$262,564,089	$31,637,263	$41,626,974	$25,920
CP	$425,080,135	$78,386,103	$84,960,887	$52,902
COMBO	$398,489,118	$89,086,664	$90,042,498	$56,066
DAF	$329,375,032	$125,064,765	$107,266,736	$66,791

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Capital and O&M costs from the Development Document. Models and data are included in the Rulemaking Record.

* Includes lesser hauling cost, if appropriate, thus capital costs may appear slightly lower and O&M costs maybe slightly different than those shown in the Development Document

As Table 4-3 shows,[15] the selected option, CP, is associated with an annual posttax cost of $85.0 million, and an annual average cost per facility of $53,000. The costs of all four options range from $41.6 million to $107.3 million on a posttax basis (1993 dollars).

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[15] Capital and O&M costs are from the Development Document. Posttax annualized costs are computed by EPA's IL Facility and Firm Financial Model (EPA, 1997) using data from the Section 308 Survey.

SECTION FIVE

ANALYSIS OF FACILITY-LEVEL IMPACTS

This section presents the facility-level economic impact methodology and reports the results of the facility economic impact analysis (closure analysis). This analysis, described in Section 5.1, uses output from the cost annualization model (discussed in Section Four) to predict facility closures. Section 5.2 summarizes the results of the analysis in terms of the number of facility closures that occur prior to regulatory compliance (baseline closures) and the number of facility closures that result from regulatory compliance (incremental closures). Section 5.3 discusses impacts on new sources.

EPA determined that 1,747 facilities are potentially affected by the proposed IL Standards.[1] To evaluate preregulatory (baseline) conditions at and postcompliance impacts on these facilities, EPA divided the facilities into two groups: facilities that are independently owned and operated ("single-facility firms") and nonindependent facilities, owned by firms that own multiple facilities. EPA classified facilities in these groups on the basis of each facility's response to Question 27 in Part B of the Section 308 Survey, which asked about the organizational structure of each facility.

A total of 830 of the 1,747 potentially affected facilities are classified as single-facility firms.[2] These facilities responded with a C or E to Question 27 in Part B of the Section 308 Survey. Single-facility firms are independently owned; in some cases, they may have an ultimate parent company, but for all intents and purposes, they act as independent entities.[3] In addition, these firm-facilities generally maintain their own

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[1] Section 308 Survey data.

[2] Discrepancies between the sum of single-facility firms and nonindependent facilities and the total number of affected facilities are caused by rounding of the survey weights assigned to each facility. Fractional facilities are created using the survey weights, but, for clarity, only integers are used to describe numbers of facilities in the text and tables of this report.

[3] As independent entities, these facilities operate as both facilities and firms. To capture both facility- and firm-level impacts for these single-facility firms, EPA evaluates them as facilities in Section Five and as firms in Section Six. Results in Section Six are incremental to the closures reported in Section Five, that is, single-facility firms reported as financially vulnerable as a result of the IL Standards in Section Six are those that do not close in Section Five. EPA used this approach in reporting results because the impacts associated
(continued...)

balance sheets and income statements and pay taxes at the facility level. Of the 830 single-facility firms, 128 are proposed to be excluded from the rule (they launder less than 1 million pounds of incoming laundry per calendar year and less than 255,000 pounds of shop towels and/or printer towels/rags per calendar year; see Section Three for more information on this group of facilities) and thus incur no compliance costs. All 830 of the single-facility firms are analyzed in this section of the EA.

A total of 917 of the 1,747 facilities are classified as nonindependent facilities. These facilities responded with A, B, or D to Question 27 in Part B of the Section 308 Survey. Nonindependent facilities are subordinate to multifacility owner companies and, in some cases, parent companies. Such facilities might maintain their own balance sheets or income statements, but financial statements are generally kept at the owner-company level. In addition, any corporate taxes associated with these facilities are typically paid by the owner company. Of the 917 nonindependent facilities, 14 are proposed to be excluded from the IL Standards and will incur no compliance costs. All 917 of the nonindependent facilities are analyzed in this section of the EA.

Because of the very different nature of the financial reporting at single-facility firms and nonindependent facilities, the following sections discuss the analysis and results of the two types of facilities separately, then together, for the 1,747 facilities in the analysis.

5.1 FACILITY IMPACT MODEL

In this study, EPA estimates facility impacts by evaluating the impact of compliance costs on a facility's cash flow. To do this, EPA compares each facility's average annual precompliance cash flow with its annualized pollution control costs. The present value of cash flow represents the value in current dollars of

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[3](...continued)
with closure for a single-facility firm are considered greater than those associated with a weakened financial position. In the industrial laundries industry, closures have a greater impact because those facilities that do not close can be sold to financially stronger firms (or in the case of single-facility firms owned by parent firms, might be able to rely on the parent for financial backing). Thus single-facility firms that do not close but become financially vulnerable might lose their status as independent entities, but other impacts at financially vulnerable firms, such as employment impacts, are likely to be minimal in this industry. (See Section Six for more details on impacts of firm failures in this industry.)

the expected cash flow that the facility can generate over a specified period (in this case 16 years; see below). If the present value of future cash flow is expected to be less than or equal to zero, EPA assumes that the facility would cease operation, as it would no longer be a profitable venture.

This approach is somewhat of a departure from other EAs and Economic Impact Analyses (EIAs) for effluent limitations guidelines and standards in which salvage value (the residual value of the facility at liquidation) was considered to play a role in an assessment of the financial viability of a facility (i.e., the decision to liquidate would be based on whether the estimated salvage value exceeded the estimated present value of cash flow). For a number of reasons, many of which relate to the fact that this is a service, not a manufacturing industry, EPA believes that using salvage value in this way for this industry could seriously overstate baseline closures, leading to an unreliable estimate of postcompliance closures (see the detailed discussion in Appendix C).

Based on the concerns outlined in Appendix C, EPA has determined that in this case (for industrial laundries and possibly other service industries), a cash-flow approach that does not consider the effect of salvage value on liquidation decisions is the most appropriate approach for analyzing the impacts of the IL Standards. Cash flow analysis is one of the most commonly used tools for financial analysis and in many instances is considered a more accurate measure of financial health than net income analysis, since net income includes depreciation as a cost even though depreciation is not a cash outlay (see, e.g., Brigham, E.F., and L.C. Gapenski, 1997. *Financial Management Theory and Practice*, pp. 40-41). Furthermore, a customer base is very closely associated with an assessment of projected cash flow. As long as cash flow appears positive, the facility is likely to be viewed as viable for acquisition and operation because this cash flow reflects a viable customer base. If the facility appears viable to others, it probably also appears viable to its current owner. In any case, closures do not take into account ownership, just whether the facility is viable to operate.

Section 5.1.1 describes the calculations used to determine the present value of future cash flow for a facility, and Section 5.1.2 discusses how closure results are evaluated using the facility impact model. Figure 5-1 provides a schematic diagram of the methodology and components used in the facility impact analysis.

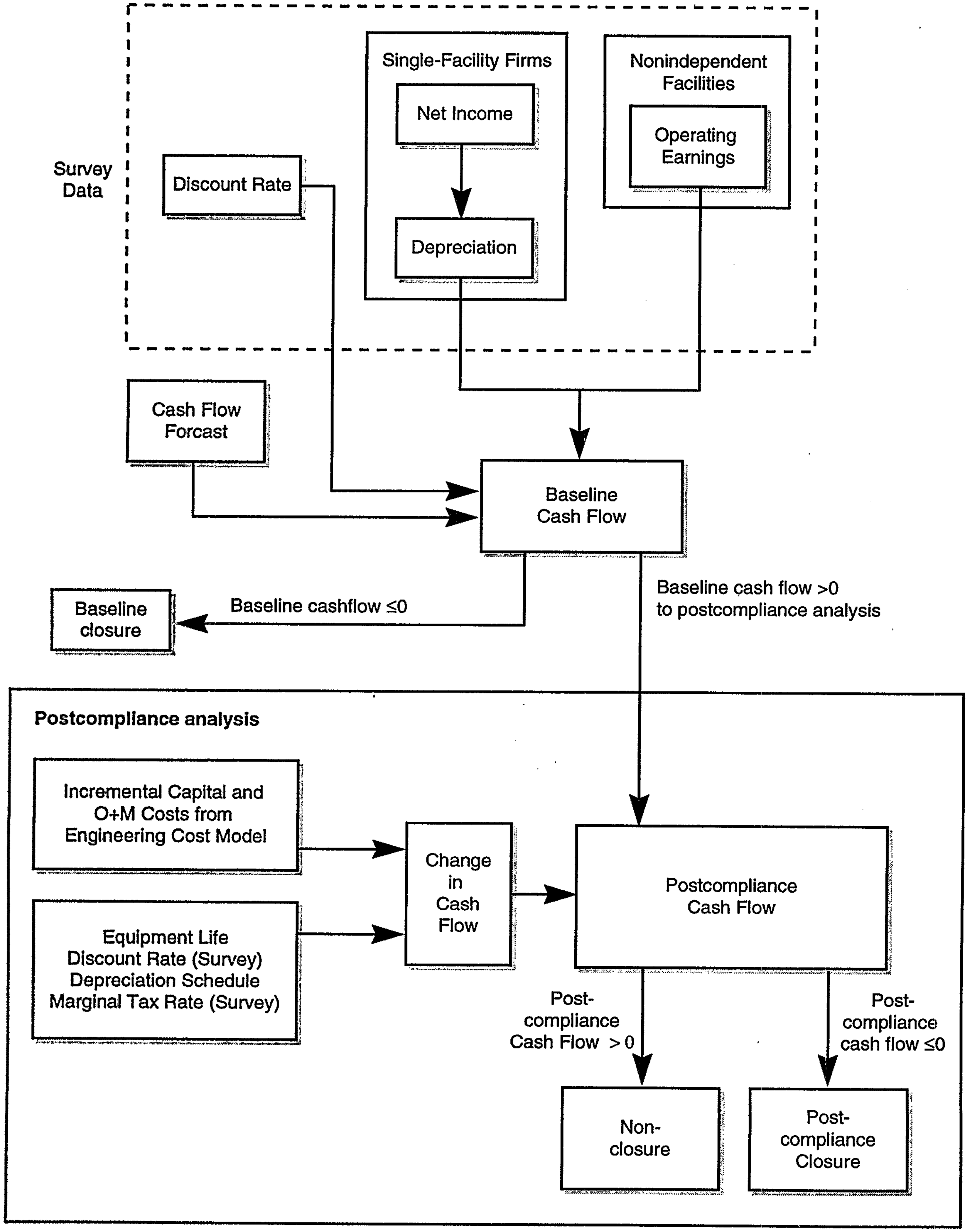

Figure 5-1. Facility impact analysis methodology.

5.1.1 Estimating the Present Value of Forecasted Cash Flow

As stated previously, the present value of each facility's cash flow is equal to its future stream of cash flow in current dollars. The impact methodology uses recent cash flow and other relevant data to estimate future earnings and then applies a discount rate to derive the present value of future cash flow. The components of this analysis include: 1) estimating current cash flow; 2) estimating the present value of future cash flow, which involves establishing a time frame for the analysis, projecting cash flow during this time frame, and discounting cash flow to the present; and 3) evaluating impacts (adjusting the regulatory baseline for baseline closures and incorporating the incremental costs of regulation).

5.1.1.1 Estimating Current Cash Flow

Before the present value of future cash flow can be estimated, EPA must estimate current cash flow. This figure is used, in turn, to project future cash flow. Estimating cash flow (current or future) involves two steps.

1. Determining net income, which is calculated as facility receipts minus operating costs, depreciation, interest, and taxes.
2. Reconciling net income to cash flow by adding back in depreciation.

In the closure model for the industrial laundries industry, cash flow at the 830 single-facility firms can be calculated using Section 308 Survey data on facility-level net income and depreciation.[4] At facilities that do not operate independently from an owner company (i.e., the 917 nonindependent facilities), however, neither cash flow nor net income can be determined using Survey data because taxes and interest are typically recorded only at the firm level, not the facility level, and firm-level Survey data were not sufficiently detailed to be applied to individual facilities. Thus, for nonindependent facilities, the closure model uses operating earnings (e.g., receipts minus total operating costs, including depreciation and costs unrelated to laundering) as an approximation for posttax facility cash flow. The remainder of this report refers to nonindependent

[4] EPA adjusted net income for all firms to account for any reported extraordinary expenses or revenue. In addition, EPA used the appropriate marginal tax rate, given the firms' taxable earnings, to further adjust net income in each year in which extraordinary expenses or revenues were reported.

facility "cash flow" to mean operating earnings. EPA did not attempt to determine the nonindependent facilities' share of total firm interest and taxes because the analysis would require data that even firms themselves might have difficulty estimating (since often this type of accounting is not undertaken) and, as such, may not even play a role in a firm's liquidation decision.

One factor that could affect cash flow at nonindependent facilities is the interfacility transfer of laundry among facilities owned by the same firm. Because this practice occurs in multifacility firms, the Section 308 Survey asked nonindependent facilities to report the value of shipments (including transfers)[5] to other facilities owned by the same firm. This figure was used to evaluate whether transfers might play a role in potentially overestimating baseline closures.[6] In some cases, respondents might have underestimated the value of transfers because transfers typically are valued at the cost of production (i.e., the cost of laundering the items), rather than at the market value of that service. Cash flow, therefore, could be understated at facilities that value transfers at the cost of production. This, in turn, could lead the facility impact model to overstate total facility closures. EPA's avoidance of a salvage value approach minimizes the likelihood that facilities that launder transferred items will be classified as baseline closures. Furthermore, EPA evaluates nonindependent facilities shown to close in the baseline at the firm level to determine if the firm can afford to continue to support a facility postcompliance, under the assumption that the facility might not close because it is not expected to be self-supporting. If the firm can afford to install and operate pollution control equipment in all of its facilities (closing or not), EPA assumes that these facilities will close neither in the baseline nor postcompliance.

5.1.1.2 Estimating the Present Value of Future Cash Flow

Current annual cash flow (or its proxy, operating earnings) can be used to estimate the present value of future cash flow by setting a time frame for the analysis (16 years, as discussed in Section Four), defining

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[5] Shipments may or may not generate revenues; transfers typically are shipments in which revenues are set equal to operating costs.

[6] EPA evaluated baseline closure facilities to determine whether transfers at cost play a role in the closure analysis, but the available information was insufficient to draw any conclusions.

any trends or cycles that the affected industry's cash flow might follow, and discounting the cash flow projected over the time frame to the present time.[7]

EPA has determined that a slightly rising cash flow forecast over the defined 16-year period (see Section Four) best fits the data provided in the Section 308 Survey, as well as that from other sources (Section Three shows that net income rises slightly in real terms between 1991 and 1993 in the surveyed facilities). To be conservative, however, EPA models growth in the industry as flat (thus avoiding the assumption that the industry can "grow" its way out of financial impacts). Because general industry information indicates that this industry is neither cyclical nor declining (see Section Three), EPA expects the flat cash flow growth projection to yield a reasonable estimate of the present value of future cash flow.

To represent this flat cash flow growth, EPA inflated 1991 and 1992 Section 308 Survey data to 1993 dollars using the change in the CPI for SIC 7218 and then took an average of the data for these 3 years. Constant 1993 dollars are used throughout the 16-year period of analysis, so a real (not a nominal) discount rate is used. The same cost of capital factor (discount rate) used in the cost annualization model is used to discount cash flow. All firms and facilities had at least 1 year's data on which to base the projection.

5.1.2 Evaluating Impacts

Establishing the Regulatory Baseline

OMB directs agencies to develop a regulatory baseline against which to judge impacts. OMB's guidance states:

> The benefits and costs of each alternative must be measured against a baseline. The baseline should be the best assessment of the way the world would look absent the proposed regulation. That assessment may consider a wide range of factors, including the likely evolution of the market...[8]

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[7] The cash flow period and the cost annualization period are the same to keep the annualized costs comparable to cash flow. Otherwise either cash flow or annualized costs might be overstated relative to the other.

[8] OMB, undated. "Memorandum for members of the regulatory working group regarding economic analysis of federal regulations under Executive Order 12886." Sally Katzen.

EPA must assess the impacts of the IL Standards against a baseline that is the Agency's best assessment of the way the world would look without the regulation. If a facility's present value of cash flow is less than or equal to zero over the 16-year timeframe, EPA's best estimate is that this facility is a baseline closure independent of the impact of this proposed rule. Although it is possible that a facility estimated to be a baseline closure might remain open, the converse also might be true—a facility projected to remain open until it is subject to the rule might actually close independently of the rule. Both results might be equally likely. If EPA were to assume that all facilities that are estimated to close in the baseline were actually postcompliance closures, this would seriously overstate impacts. To avoid either seriously overstating or understating impacts, EPA has chosen to estimate postcompliance closures by counting facilities that are projected to close solely due to the effects of the rule.

Furthermore, as noted earlier in Section 5.1.1.1, EPA does assess impacts on nonindependent facilities that are estimated to close in the baseline by investigating whether the firm can continue to support the facility in the firm failure analysis. The nonindependent facilities with negative or zero operating earnings as reported in the Section 308 survey are assumed likely to be subsidized by their owners, since they are not supporting themselves currently. If they are being subsidized in the baseline, then EPA can assume they will continue to be subsidized postcompliance, as long as the firm can afford to continue to support all of its facilities postcompliance (which is analyzed in Section Six). Thus only a few single-facility firms are assumed to close regardless of the IL Standards and even fewer would be subject to the rule, regardless of their baseline status (many are excluded facilities). The number of single-facility firms involved is thus very small and certainly within the expected number that might close over a period of a few years. Just in the time between when the screener survey was sent out and when the Section 308 Survey was issued, some survey facilities were reported to have closed or otherwise ceased to operate.

For all of these reasons, EPA creates a regulatory baseline by evaluating the *current* baseline (represented by the data collected in the Section 308 Survey) and determining which facilities are likely to close regardless of regulatory requirements, as directed by OMB Guidance. The facilities that are not expected to close are then used to establish the *regulatory* (as opposed to the current) baseline. This regulatory baseline is the one against which incremental impacts in the postcompliance closure analysis are measured. In analysis of the *current* baseline, EPA uses the model as described above to calculate the present value of the cash flow stream over the 16-year time frame. If a facility's present value of cash flow (current baseline cash flow) is less than or equal to zero, EPA classifies that facility as a "baseline closure." These "closure" facilities are eliminated from the regulatory baseline used in the subsequent, postcompliance closure analysis either because such closures are expected to occur regardless of the IL Standards and therefore cannot be attributed to increased regulatory costs, or because the closure analysis is irrelevant, and the appropriate level of analysis is at the firm level (for nonindependent facilities that are not self-supporting).

Incorporating Compliance Costs

For the postcompliance closure analysis, EPA calculates the impacts of regulatory costs on cash flow using the facility-specific posttax annualized costs for each regulatory option and an estimate of the depreciation allowed on the compliance investment calculated by EPA's cost annualization model (see Section Four). This figure is then subtracted from baseline cash flow to compute each facility's postcompliance cash flow.

Not all of these compliance costs, however, will be borne by the affected facilities. EPA conducted a market analysis of the industrial laundry industry and concluded that a portion of compliance costs (approximately 32 percent of costs) could be passed through to industrial laundry customers as a price increase (see Appendix A). Thus only 68 percent of the compliance costs (in the form of the present value of cash outlays for compliance) is actually used in the calculations described above. Appendix D presents (as a sensitivity analysis) facility closure results under the assumption that no price increases are possible (i.e., the facilities bear 100 percent of the compliance costs). These results represent an upper bound of impact on the affected facilities.[9] EPA strongly believes that a zero-cost passthrough scenario is overly conservative. Because EPA's market model is associated with a low standard error overall, a relatively high R-squared value, and probabilities for variables placing all very near or within the 90 percent confidence interval (see Appendix A), EPA believes that the market model is a good predictor of postcompliance price, and thus a good predictor of the industry's ability to raise prices.

[9]As the Appendix shows, only two additional facilities would close if no costs can be passed through to customers.

The model predicts that, under the proposed option, prices will rise, on average approximately 0.3 cents per pound of laundry, or about 0.4 percent. From a common sense perspective, EPA believes customers will be unable to distinguish price increases of this magnitude from expected inflation. Furthermore, even with an assumption of 100 percent cost passthrough, prices would rise an average of less than 1 cent per pound, or a little over 1 percent.

After computing the postcompliance cash flow, the model notes for which facilities postcompliance cash flow is less than or equal to zero and classifies these facilities as closures. The model actually annualizes these costs and compares them to the baseline annual estimate of cash flow for simplicity and speed of model calculations, since in a zero-growth scenario, results are identical (in terms of whether precompliance cash flow is less than or equal to zero) whether annualized values or present values are used. The number of estimated closures under each regulatory scenario is recorded by revenue size and option for all facilities.

5.2 RESULTS

5.2.1 Baseline Closures

Table 5-1 presents the results of the baseline analysis by type of facility and by revenue categories within each facility type. The results of the analysis indicate that 51 nonindependent facilities (about 6 percent) close in the baseline, (one is an excluded facility) and about 96 single-facility firms (or 11.6 percent) close in the baseline. However, 39 of these single-facility firms are excluded facilities, so the rule will have no effect on them anyway. A total of 57 nonexcluded, single-facility firms close in the baseline, which is only about 8 percent of all nonexcluded, single-facility firms.

It is likely that many of the nonindependent facilities shown to close in this analysis are transfer facilities, or are facilities otherwise supported by their firms, and therefore probably will close neither in the baseline nor postcompliance as discussed above in Section 5.1.1.1. The ability of firms to afford to continue to support nonindependent facilities postcompliance is assessed in Section Six. Therefore, the number of

Table 5-1

Baseline Closure Analysis - All Facilities

Revenue Groups ($000)	Closures		Nonclosures		Total
	Number	Percentage of Revenue Group	Number	Percentage of Revenue Group	
Nonindependent Facilities					
Total	51	5.6%	866	94.4%	917
< $1 Million	25	52.8%	22	47.2%	47
>= $1 and < $3.5 Million	4	1.5%	253	98.5%	257
>= $3.5 and < $7 Million	21	5.2%	389	94.8%	410
>= $7 and < $10.5 Million	1	0.9%	155	99.1%	156
>= $10.5 Million	0	0.0%	47	100.0%	47
Single-Facility Firms					
Total	96	11.6%	734	88.4%	830
< $1 Million	72	39.7%	110	60.3%	182
>= $1 and < $3.5 Million	2	0.6%	290	99.4%	292
>= $3.5 and < $7 Million	22	8.7%	236	91.3%	258
>= $7 and < $10.5 Million	0	0.0%	81	100.0%	81
>= $10.5 Million	0	0.0%	18	100.0%	18

Note: Discrepancies in the number of facilities are due to rounding errors.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

baseline closures estimated at this stage of the analysis 96 facilities, of which only 57 are not excluded anyway. These 57 single-facility firms amount to only 3.3 percent of all in-scope facilities (1,747 facilities).[10]

As discussed earlier in Section 5.1.2, none of the 147 baseline closure facilities (both excluded and nonexcluded) is analyzed in the postcompliance closure analysis. The total number of potentially affected facilities is adjusted downward to exclude facilities predicted to be baseline closures (single-facility firms) or estimated to be not self-supporting (nonindependent facilities that must be analyzed at the firm level); therefore, only facilities that are self-supporting (nonindependent facilities) and/or financially viable in the baseline (single-facility firms) are analyzed in the postcompliance analysis.[11] These facilities include 734 single-facility firms and 866 nonindependent facilities for a total of 1,600 facilities.

5.2.2 Postcompliance Closures

Tables 5-2 and 5-3 present the results of postcompliance analysis for each regulatory option under consideration for single-facility firms and nonindependent facilities, respectively. As with the baseline results, the postcompliance results are presented by revenue categories. The results presented in these two tables indicate that single-facility firms and facilities in the revenue category of $3.5 to $7 million are the most affected group.

As Tables 5-2 through 5-4 show, the proposed option, CP (with the exclusion as proposed), is associated with 33 closures. Note that few impacts occur under most options for facilities with revenues less than $1 million; this group constitutes the major portion of the facilities that are proposed to be excluded under the IL Standards.

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[10] Note that four nonexcluded single-facility firms that are shown to close in the baseline have ultimate parent companies that might be supporting these firms and could continue to support them postcompliance. To be conservative, however, EPA does not extend this closure analysis to parent companies, but measures baseline conditions and impacts against the most vulnerable corporate levels.

[11] As will be shown in Section Six, all multifacility firms that are not baseline firm failures can afford to install and operate pollution control equipment at all of their facilities, thus the 50 nonindependent facilities shown to close in the baseline might not close in either the baseline nor the postcompliance for the reasons outlined above in Section 5.1.1.1.

Table 5-2

Facility Closure Analysis - Single-Facility Firms*

Closures	OC	CP	COMBO	DAF
All facilities (N=734)				
Closures	0	33	33	33
Percentage of all facilities	0.0%	4.5%	4.5%	4.5%
Facilities with revenues less than $1 million (N=110)				
Closures	0	1	1	1
Percentage of all facilities	0.0%	0.2%	0.2%	0.2%
Percentage of revenue group	0.0%	1.3%	1.3%	1.3%
Facilities with revenues >= $1 million and < $3.5 million (N=290)				
Closures	0	1	1	1
Percentage of all facilities	0.0%	0.2%	0.2%	0.2%
Percentage of revenue group	0.0%	0.5%	0.5%	0.5%
Facilities with revenues >=$3.5 million and < $7 million (N=236)				
Closures	0	30	30	30
Percentage of all facilities	0.0%	4.1%	4.1%	4.1%
Percentage of revenue group	0.0%	12.8%	12.8%	12.8%
Facilities with revenues >=$7 million and <$10.5 million (N=81)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Facilities with revenues >=$10.5 million (N=18)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%

* Excluding baseline closures and setting regulatory costs to zero for facilities with < 1 million pounds in annual production and < 255,000 pounds of shop and printer towels/rags annually.

Note: Discrepancies in the number of facilities are due to rounding.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

Table 5-3

Facility Closure Analysis - Nonindependent Facilities*

Closures	OC	CP	COMBO	DAF
All facilities (N=866)				
Closures	3	0	0	1
Percentage of all facilities	0.3%	0.0%	0.0%	0.1%
Facilities with revenues less than $1 million (N=22)				
Closures	1	0	0	0
Percentage of all facilities	0.2%	0.0%	0.0%	0.0%
Percentage of revenue group	6.3%	0.0%	0.0%	0.0%
Facilities with revenues >= $1 million and < $3.5 million (N=253)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Facilities with revenues >=$3.5 million and < $7 million (N=389)				
Closures	1	0	0	1
Percentage of all facilities	0.1%	0.0%	0.0%	0.1%
Percentage of revenue group	0.3%	0.0%	0.0%	0.3%
Facilities with revenues >=$7 million and <$10.5 million (N=155)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Facilities with revenues >=$10.5 million (N=47)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%

* Excluding baseline closures and setting regulatory costs to zero for facilities with < 1 million pounds in annual production and < 255,000 pounds of shop and printer towels/rags annually.

Note: Discrepancies in the number of facilities are due to rounding.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

Table 5-4

Facility Closure Analysis - All Facilities*

Closures	OC	CP	COMBO	DAF
All facilities (N=1600)				
Closures	3	33	33	34
Percentage of all facilities	0.2%	2.1%	2.1%	2.1%
Facilities with revenues less than $1 million (N=132)				
Closures	1	1	1	1
Percentage of all facilities	0.1%	0.1%	0.1%	0.1%
Percentage of revenue group	1.0%	1.0%	1.0%	1.0%
Facilities with revenues >= $1 million and < $3.5 million (N=544)				
Closures	0	1	1	1
Percentage of all facilities	0.0%	0.1%	0.1%	0.1%
Percentage of revenue group	0.0%	0.2%	0.2%	0.2%
Facilities with revenues >=$3.5 million and < $7 million (N=624)				
Closures	1	30	30	31
Percentage of all facilities	0.1%	1.9%	1.9%	2.0%
Percentage of revenue group	0.2%	4.8%	4.8%	5.0%
Facilities with revenues >=$7 million and <$10.5 million (N=235)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Facilities with revenues >=$10.5 million (N=65)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%

* Excluding baseline closures and setting regulatory costs to zero for facilities with < 1 million pounds in annual production and < 255,000 pounds of shop and printer towels/rags annually.

Note: Discrepancies in the number of facilities are due to rounding.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

Table 5-4 sums the results of Tables 5-2 and 5-3. Overall, impacts range from 3 closures under the OC option to 34 closures under DAF (from 0.2 percent to 2.1 percent of all facilities in the postcompliance analysis). The proposed option, CP, is associated with 33 closures (2.1 percent of all facilities in the postcompliance analysis). Appendix D presents results assuming no costs can be passed through to customers (results are nearly identical). Appendix E presents a discussion of estimated impacts without the exclusion for industrial laundry facilities laundering less than 1 million total pounds and under 255,000 shop and printer towels/rags annually. Without the exclusion, substantially more facilities are shown to close postcompliance.

5.3 IMPACTS ON NEW SOURCES

EPA investigated all options considered under PSES as potential PSNS options. EPA selected the CP option for both sets of proposed standards. This section presents EPA's assessment of impacts on new sources. EPA assesses impacts on new sources by determining whether the proposed rule would result in a barrier to entry into the market.

EPA has found that overall impacts from the proposed IL Standards on new sources would not be any more severe than those on existing sources, since the costs faced by new sources generally will be the same as or less than those faced by existing sources. It is typically less expensive to incorporate pollution control equipment into the design at a new plant than it is to retrofit the same pollution control equipment in an existing plant because no demolition is required, and space constraints, which can add to costs if specially designed equipment must be ordered, usually are not an issue in new construction. Because most new sources and existing sources face the similar costs, EPA has determined that PSNS requirements should not pose a barrier to entry on the basis of competitiveness. EPA also has shown CP to be an economically achievable option, having an acceptable level of impact on existing sources. Therefore, the same requirements for PSNS also should have an acceptable level of impact on most new facilities.

EPA also examined whether there would be a barrier to entry for small new sources. EPA proposes not to exclude these new sources because it has found it to be economically achievable for these new sources to comply with the CP standards contained in the proposed rule. Based on the Section 308 Survey data, EPA expects that new sources generally exceed the threshold size cutoff that EPA proposed for existing sources.

EPA investigated facilities in the Section 308 Survey that indicated they were new or relatively new at the time of the survey. The number of new source facilities coming on line each year is extremely small. Over a three year period (1991, 1992, and 1993), according to Section 308 Survey data, laundry operations began only at about 80 facilities (and it is not absolutely clear from the data whether these facilities were actually new discharges or were existing dischargers acquired in that year by a different firm). Over the 3-year period, this amounts to 27 new sources a year at most, or only 1.5 percent of existing facilities. Given the small level of growth in the industrial laundries industry (see Section Three), EPA believes that new sources are primarily replacing production from closing facilities that exit the market.

Of these facilities identified as new or relatively new facilities, EPA determined that the average revenues of this group exceeded $4 million per year, and the average amount of laundry processed averaged over 5 million pounds per year. Only 24 facilities out of 80 total newer facilities (weighted), or 30 percent, would meet the size threshold for the exclusion applicable to existing sources. On a yearly basis (given that 24 facilities started up over the 3 years of the survey) EPA estimates that up to 8 facilities of the size that would meet an exclusion similar to that for existing sources might be started up each year. Overall, in the group of 80 facilities, only 6 facilities (weighted) were identified as postcompliance closures (based on a closure by one surveyed nonindependent facility). No single-facility firm would close postcompliance. EPA is less concerned about a closure of a nonindependent facility, since nonindependent facilities often can fall back on their parent firm during the financially shaky first few start up years. Furthermore, these 6 facilities are represented by a survey facility that might, on the basis of the types of laundry processed, be able to meet the requirements of the rule possibly without having to install any pollution control whatsoever (that is, their current effluent might not exceed the CP-based limits). EPA has conservatively assigned this facility compliance costs because the Agency has no sampling data from this facility to support this assertion. Given the above results, EPA finds that not excluding new sources processing under 1 million pounds of water-washed laundry and under 255,000 pounds of shop towels and printers towels/rags annually from PSNS will be economically achievable and will present no barriers to entry.

EPA also investigated whether there might be a barrier to entry due to competitive disadvantages for all new sources in markets where excluded facilities are located. According to the Section 308 Survey, excluded facilities process only 0.7 percent of the laundry processed by all facilities represented in the survey. EPA thus concludes that the market share of excluded facilities is so small that excluded facilities are unlikely to have a measurable impact in the market for industrial laundry services. Furthermore, EPA has shown that even if no compliance costs are passed through to customers (see Appendix D), the impacts are similar to the results assuming cost passthrough does occur, and thus new sources should be able to compete with excluded facilities on price (by not raising prices) even if they perceive the need. EPA thus concludes that competition with excluded facilities will not pose a barrier to entry.

SECTION SIX

ANALYSIS OF FIRM-LEVEL IMPACTS

The firm-level analysis evaluates the effects of regulatory compliance on firms owning one or more affected industrial laundry facilities. It also serves to identify impacts not captured in the facility analysis. For example, some firms might be too weak financially to undertake the investment in the required effluent treatment, even though the investment might seem financially feasible at the facility level. Such circumstances can exist, in particular, at firms owning more than one facility subject to regulation. Given the range of possible firm-level impacts, the firm-level analysis is an important component of this EA.

EPA determined that 903 firms are potentially affected by the proposed IL Standards. To evaluate precompliance conditions at and postcompliance impacts on these firms, EPA divided the firms into two categories—single-facility firms (described in Section Five) and multifacility firms. As with facility groupings in Section Five, EPA based firm groupings on responses to Question 27 in Part B of the Section 308 questionnaire, which asked about organizational structure. Because of the differences in organizational structure and size between two categories of firms (discussed below), results are presented separately for each type of firm.

A total of 830 firms classified themselves as single-facility firms by responding with C or E to Question 27 in Part B of the Section 308 Survey.[1] These firms operate as independent entities, although, in some cases, single-facility firms can have an ultimate parent company. As independent entities, these firms maintain balance sheets and income statements and pay corporate taxes on their own earnings. Single-facility firms also are generally smaller than multifacility firms in terms of revenues, production, and employment. Of these firms, 128 meet the definition of the small industrial laundries exclusion and thus incur no compliance costs. Note that 33 single-facility firms were estimated to close in the postcompliance analysis in Section Five. To avoid double counting impacts, these firms are removed from the results of the firm-level analysis.

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[1]As noted in Section Five, single-facility firms are both firms and facilities. To fully capture both facility- and firm-level impacts for these firms, EPA evaluates them as facilities in Section Five and as firms in Section Six.

Section Nine discusses the combined impacts of closures and failures on small firms in the industrial laundries industry.

In addition to the 830 single facility firms, EPA estimated that there are 73 multifacility firms. Multifacility firms are those whose facility representatives responded with A, B, or D to Question 27 in Part B of the Section 308 Survey;[2] these firms own and operate more than one facility and have at least one industrial laundry facility.[3] In addition, they maintain financial records for all their facilities at the firm level and typically pay corporate taxes at the firm level for all owned facilities. As noted above (and as shown in Section Three), multifacility firms tend to be substantially larger than single-facility firms.[4]

The basic core of the firm-level analysis, both for single-facility and multifacility firms, is the Altman Z"-score analysis, a ratio analysis that employs several indicators of financial viability to assess firm-level

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[2] Because the Section 308 Survey only sampled industrial laundry facilities, EPA believes that the number of surveyed owner companies of nonindependent facilities (the multifacility firms) does not include all firms likely to own industrial laundry facilities. To estimate the total number of multifacility firms (not just those surveyed), EPA compared the survey-weighted number of nonindependent facilities (those responding with A, B, or D to Question 27) to the total number of industrial laundry facilities reported owned by the surveyed firms with nonindependent facilities. (Most surveyed multifacility firms reported owning more than one industrial laundry facility). EPA determined that the ratio of total survey-weighted nonindependent facilities to the sum of the number of facilities the surveyed multifacility firms reported owning is 1.7 (i.e., 1.7 times as many nonindependent facilities were estimated using the survey weights than the surveyed multifacility firms report owning). EPA assumed that the difference between these two numbers of facilities reflects the number of facilities owned by nonsurveyed firms. EPA therefore used this ratio as if it were a statistical weight to estimate the total number of multifacility firms, multiplying the number of surveyed multifacility firms by 1.7. Results of the firm-level analyses for multifacility firms were likewise multiplied by 1.7. Basically, this approach embodies the assumption that the nonsurveyed firms own the same average number of industrial laundry facilities as the surveyed firms. EPA considers this assumption to be reasonable because it has no reasons to believe that the nonsurveyed firms as a group are any different from the surveyed firms.

[3] For example, a firm owning a number of hotels and laundries might own only one laundry that meets the definition of an industrial laundry, with its remaining facilities being either hotels or linen supply laundries.

[4] Impacts on parent companies (i.e., owners of the owner companies) are not analyzed in this EA because the impacts of a given facility closure or major facility-level capital investment become more dilute as assets increase at higher levels in the corporate hierarchy. Thus EPA's analysis assumes that the impacts fall on the most vulnerable firms. Had EPA assumed that the firms in the analysis could be "bailed out" by their parent companies, impacts would most likely have appeared less. For most of the 830 single-facility firms, however, analysis at the facility level, firm level, and corporate parent level coincide.

precompliance conditions and postcompliance impacts. Section 6.1 presents an overview of this ratio analysis methodology. Section 6.2 discusses the Altman Z"-score model as it applies to the industrial laundries industry. Section 6.3 summarizes the results of the firm-level analysis in terms of the number of firms that face bankruptcy prior to regulatory compliance (baseline bankruptcies) and the number of firms that experience bankruptcy as a result of additional regulatory compliance costs (incremental bankruptcies). It also discusses the number of firms that, while considered financially healthy in the baseline, slip from the financially healthy category into an indeterminate category in the postcompliance analysis (this is considered an impact short of bankruptcy). Results are presented under an assumption that a portion of the compliance costs can be passed through to customers, based on EPA's analysis of the industrial laundries market (see Appendix A). Appendix D presents an alternative analysis assuming that no compliance costs can be passed through to the industry's customers.

6.1 RATIO ANALYSIS METHODOLOGY

Ratio analyses are conducted from the perspective of creditors and equity investors who would finance a company's treatment system investment. To attract financing for a treatment system, a company must demonstrate financial strength both before and, on a projected basis, after the treatment system has been purchased and installed. The ratio analysis undertaken in this section simulates the analysis an investor and/or creditor would be likely to employ in deciding whether to finance a treatment system or make any other investment in the firm.

The baseline ratio analysis evaluates the company's financial viability before the investment, and the postcompliance analysis predicts the company's financial condition subsequent to the investment. The baseline analysis identifies companies in extremely weak financial condition, independent of pending regulatory actions. Such companies are at risk of financial failure even without the additional cost of the regulation. Firms that are projected to fail in the baseline analysis are excluded from the postcompliance analysis. This development of a regulatory baseline is consistent with OMB guidance, as discussed in Section Five.[5]

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[5] OMB, undated. "Memorandum for members of the regulatory working group regarding economic analysis of federal regulations under Executive Order 12866." Sally Katzen.

The postcompliance analysis identifies companies for which regulatory compliance poses a threat to financial viability, although they are otherwise financially sound. Such companies could be weakened by the costs of meeting the requirements of the rule. These companies are characterized as experiencing a larger impact from the IL Standards than the majority of industrial laundry firms.

For the industrial laundries industry, a ratio analysis based on the Altman Z"-score is used to characterize the baseline and postregulatory financial conditions of potentially affected firms. This method is described in more detail below.

The Altman Z"-score, originally developed in the late 1960s for manufacturing firms, is a multidiscriminant analysis (MDA) used to assess bankruptcy potential.[6,7] Over the years, the Altman Z-score model has gained acceptance among financial institutions[8] and, more recently, has been used by EPA in the regulatory impact analyses for centralized waste treaters and the pulp and paper industry. Altman's Z-score model analyzes a number of financial ratios simultaneously to arrive at a single number to predict the overall financial health of a particular firm. The advantage of the Altman Z-score model over traditional ratio analysis is its simultaneous financial consideration of liquidity, asset management, debt management, profitability, and market value. It addresses the problem of how to interpret a series of financial ratios when some financial ratios look "good" while other ratios look "bad."[9] The Altman Z-function is given in Equation 1:

$$Z = 1.2X_1 + 1.4X_2 + 0.33X_3 + 0.06X_4 + 0.999X_5 \quad (1)$$

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[6] Multidiscriminant analysis is a statistical procedure similar to regression analysis. It is used primarily to classify or make predictions in cases where the dependent variable is qualitative. In this case, the dependent variable would be "financially stable" or "financially unstable."

[7] Altman, Edward, 1993. *Corporate Financial Distress and Bankruptcy*. New York: John Wiley and Sons.

[8] See for example, Altman, 1993, *Ibid.*; Brealy, Richard A., and Stewart C. Meyers, 1996. *Principles of Corporate Finance*, McGraw Hill Companies, Inc.; and Brigham, E.F., and L.C. Gapenski, 1997. *Financial Management Theory and Practice.* Chicago: The Dryden Press, 8th edition, pp. 1064-1066.

[9] Brigham, Eugene F., and Louis C. Gapenski, 1997. *Ibid.*

where,

$$Z = \textit{Overall Index}$$

$$X_1 = \frac{\textit{Working Capital}}{\textit{Total Assets}}$$

$$X_2 = \frac{\textit{Retained Earnings}}{\textit{Total Assets}}$$

$$X_3 = \frac{\textit{Earnings Before Interest and Taxes}}{\textit{Total Assets}}$$

$$X_4 = \frac{\textit{Market Value of Equity}}{\textit{Book Value of Total Liabilities}}$$

$$X_5 = \frac{\textit{Sales}}{\textit{Total Assets}}$$

In a later work, Altman developed two modified versions of this original model for use in evaluating privately held firms (Z'-score) and firms within a service industry (Z"-score).[10] In the original model, the market value component (X_4) uses stock price data; consequently, the Altman Z-score is only applicable to firms with publicly traded stock. The Z'-score model substitutes the book value of equity (owner equity) for the market value in X_4 and thus can be used to evaluate privately and publicly held firms on an equal basis.

Altman developed the Z" function to extend the analysis to nonmanufacturing industrial firms. This revision removes the sales/asset component (X_5) to minimize the industry-sensitive aspect of asset turnover. Altman further notes that, "This particular model is also useful within an industry where the type of financing of assets differs greatly among firms and important adjustments, like lease capitalization, are not made."[11]

Because the industrial laundries industry is a nonmanufacturing industry, the Altman Z"-score is the most appropriate model to use to evaluate the financial conditions of firms in this industry. The equation for the Altman Z"-score model is shown in Equation 2:

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[10] Altman, Edward. 1993. *Op. cit.*

[11] *Ibid.*

$$Z' = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4 \quad (2)$$

where,

$$Z' = \textit{Overall Index}$$

$$X_1 = \frac{\textit{Working Capital}}{\textit{Total Assets}}$$

$$X_2 = \frac{\textit{Retained Earnings}}{\textit{Total Assets}}$$

$$X_3 = \frac{\textit{Earnings Before Interest and Taxes (EBIT)}}{\textit{Total Assets}}$$

$$X_4 = \frac{\textit{Owner Equity}}{\textit{Total Liabilities}}$$

Each of the above ratios is further defined below.

- ***Working Capital to Total Assets*** is a liquidity ratio which measures a firm's net liquid assets relative to total capitalization.[12]
- ***Retained Earnings to Total Assets*** indicates the total amount of reinvested earnings and/or losses associated with a firm over its entire life, relative to total capitalization. [13]
- ***EBIT to Total Assets*** measures the productivity of a firm's assets. Earnings are total firm revenues minus total firm costs (including general and administrative costs and depreciation).
- ***Owner Equity to Total Liabilities*** is a solvency ratio that measures the firm's total indebtedness to the venture capital invested by the owners. High debt levels can indicate high levels of risk.

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[12] Working capital is current assets minus current liabilities and is a measure of available cash on hand.

[13] For this analysis, owner equity (which is total assets minus total liabilities) is used as a proxy for retained earnings. Owner equity includes retained earnings; it also includes paid-in capital, which is the dollar amount over par in stock value. Many industrial laundries are believed to be privately held (according to the Section 308 Survey, 42 percent are S corporations or other noncorporate entities, which are typically privately held) thus owner equity will equal retained earnings in these cases.

Taken individually, each of the ratios given above (X_1 through X_4) is higher for firms in good financial condition and lower for firms in poor financial condition. Consequently, the greater a firm's bankruptcy potential, the lower its discriminant score. An Altman Z"-score below 1.1 indicates that bankruptcy is likely; a score above 2.6 indicates that bankruptcy is unlikely. Z"-scores between 1.1 and 2.6 are indeterminate.[14] EPA treats firms with indeterminate scores as financially viable but nevertheless undertakes a separate postcompliance analysis of firms that have baseline scores in the range indicating that bankruptcy is unlikely and postcompliance scores in the indeterminate range. These firms are considered to experience some financial distress short of bankruptcy.

6.2 EVALUATING BASELINE AND POSTCOMPLIANCE RATIOS

6.2.1 Baseline Analysis

As discussed in Section Five, OMB requires EPA to establish a regulatory baseline. There are a number of firms in this analysis that are likely to fail before the rule is promulgated. As in Section Five, EPA divides vulnerable firms into those likeliest to fail in the baseline vs. those likeliest to fail postcompliance as a way to avoid either overcounting or undercounting impacts.

The baseline analysis uses the Altman Z"-score model to separate financially healthy firms from those likely to fail regardless of whether the regulation is promulgated. To evaluate the baseline viability of the companies analyzed, the baseline Altman Z"-score values were calculated for each firm using Section 308 Survey data. Where sufficient data were available, 3-year average (1990-1993) financial ratios were calculated and used as the baseline ratios.[15] At a minimum, 1 year of data was available for all firms.

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[14]Altman, 1993. *Op. cit.*

[15] Data on assets, liabilities, owner equity, and EBIT from the Section 308 Survey were inflated by the CPI for SIC 2718 and averaged over the available years of data (which ranged from 1 to 3 years).

Those firms with baseline scores below 1.1 are considered baseline failures[16] and are removed from the analysis.[17] All other firms (including those with scores in the indeterminate range) are included in the postcompliance analysis.

6.2.2 Postcompliance Analysis

EPA undertakes postcompliance analysis for those firms found to be financially viable in the baseline analysis (i.e., those firms for which the baseline results are "bankruptcy unlikely" or "indeterminate").[18] The total number of potentially affected firms in the postcompliance analysis is adjusted downward to exclude the baseline bankruptcies.

Postcompliance bankruptcy predictions are based on changes in the financial status of a firm as a result of incremental pollution control costs.[19] The change in a firm's bankruptcy potential as a result of incremental pollution control costs, as predicted by the Altman Z"-score, is determined using firm-specific capital and annual O&M costs associated with each regulatory option. For the postcompliance analysis, the relevant survey data (total assets, total liabilities, and EBIT) are adjusted to reflect annual facility compliance

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[16] The terms "failure" and "bankruptcy" are used interchangeably in this EA.

[17] In the rare instance when single-facility firms were shown to close in the baseline in Section Five but to remain open in Section Six, these closures are also considered baseline failures because EPA assumes that single-facility firms that close in the baseline are not financially viable as firms and assigns them an Altman Z" score of 1.00. The facilities in this group are generally firms with very strong equity positions that closed in the baseline facility-level analysis because they reported a small negative cash flow. These firms were found to have baseline Altman Z"-scores in the "bankruptcy unlikely" or "indeterminate" range, so would not have been shown to fail in the baseline without this additional consideration. This approach was taken for consistency with the baseline closure analysis, which also characterized single-facility firms that closed in the baseline as baseline firm failures.

[18] As noted above, EPA considers firms with Z"-scores that fall in the "indeterminate" range to be viable operations, although the financial stability of these firms might be somewhat uncertain.

[19] The annualized pollution control costs for each option were calculated with the cost annualization model described in Section Four.

costs for all facilities owned by a particular company.[20] Compliance costs for each facility owned by each company are incorporated into the analysis as follows:

- Postcompliance Total Assets = Total Assets + Capital Cost (3)
- Postcompliance Total Liabilities = Total Liabilities + Capital Cost (4)
- Postcompliance EBIT = EBIT – (Postcompliance Change in EBIT)[21, 22] (5)

The postcompliance analysis is performed under the assumption that the industry can pass through some portion of compliance costs to its customers. (The percentage cost passthrough is estimated by the market model analysis discussed in Appendix A). The change in EBIT presented in Equation (5) reflects the estimated cost passthrough.[23] The results of the alternative assumption that firms are unable to raise prices to

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[20] To estimate firm-level impacts at multifacility firms owning nonsurveyed industrial laundry facilities, EPA assumes that the capital costs and change in EBIT associated with compliance costs for *nonsurveyed* facilities are equal to the capital costs and change in EBIT at the surveyed nonindependent facility with the median annual compliance costs. For each multifacility firm, costs and change in EBIT for surveyed facilities are summed with estimated costs and change in EBIT for nonsurveyed facilities to develop firm-level figures. The number of nonsurveyed industrial laundry facilities owned by each multifacility firm is calculated based on responses to the Section 308 Survey, which asks for the total number of industrial laundry facilities owned by the firm.

[21] These calculations assume 100 percent financing of compliance equipment through long-term debt, although tax shield on interest payments are not included (see Appendix B). Firms are assumed to incur all compliance costs for all facilities regardless of whether the facilities close in the baseline or postcompliance facility-level analyses, since liquidation and other costs associated with a facility closure will not exceed the compliance costs associated with a closing facility. Note that working capital and owner equity do not change with compliance costs because current assets and liabilities are assumed to be unaffected by long-term debt and total assets and total liabilities are assumed to change in tandem (i.e., as debt is paid off, depreciation reduces the book value of the asset).

[22] The postcompliance change in EBIT (in absolute value terms) is calculated using the cost annualization model described in Section Four. The total pretax cash outflows calculated by this model are composed of cash outflows for depreciation and O&M. The change in EBIT related to compliance costs corresponds to the change in O&M plus the change in the depreciation expenses. EPA adds the present value (PV) of depreciation to the PV of O&M payments to calculate the PV of the change in EBIT. This value is then annualized. The value is annualized because the Altman Z analysis is a period-by-period analysis (i.e., a firm's health is analyzed on the basis of one or more "snapshots" corresponding to, for example, quarterly or annual accounting reports). EPA is creating a 1-year Altman Z" analysis for simplicity and speed in model calculations.

[23] Postcompliance EBIT is calculated in the following manner to reflect the cost passthrough

(continued...)

pass through costs are presented in Appendix D. EPA considers this worst-case scenario highly unlikely, as discussed in Section Five.

Note that even if a firm is considered likely to fail, its facilities (as determined in the facility-closure analysis) might not close. In the cases where a firm is considered likely to fail, its viable facilities could be sold as part of the company liquidation process and operated successfully under different ownership. Also note that some facilities could be sold (and continue to operate) to raise the necessary capital to finance the installation of pollution control equipment at a firm's remaining facilities. Thus multifacility firms that are estimated to fail but that do not have facilities that are estimated to close (as discussed in Section Five) are not considered as severely affected as firms that are estimated to fail and to have to close some or all of their facilities. Single-facility firms that fail but do not close are assumed to be sold, so the primary impact to these firms is their loss of independent status. This impact is considered to be a lesser impact than closure and, further, has minimal impact on employment in the industry.[24] Single-facility firms that fail and close would not be counted here because the significant impacts to these entities are already captured in the closure analysis in Section Five. Note that EPA found no firm that would both fail and close in the postcompliance analysis prior to any adjustments to eliminate double counting of impacts. This result occurs because the equity positions of the closing firms are relatively strong and the postcompliance cashflow position is not strongly negative. This result indicates that cost-cutting or other similar measures might be sufficient to prevent these closures. EPA, however, does not make this assumption, to be conservative.

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[23](...continued)
assumption:

Baseline EBIT - [(change in EBIT)*(1 - 0.32)]
where changes in EBIT = depreciation + O&M

[24] This is not always the case in all industries, but does tend to be true for industrial laundries. These firms are not asset-rich, and hold little attraction for predatory takeovers with subsequent liquidation. Furthermore, single-facility firms' markets are tied to their physical locations (service areas), unlike manufacturing firms' markets, which are likely to be independent of their locations. Therefore, jobs tend to stay in the local market area more readily in this industry than in many manufacturing industries. See also discussion in Section Three discussing the nature of acquisition in the industry.

6.3 BASELINE AND POSTCOMPLIANCE ALTMAN Z"-SCORE RESULTS

6.3.1 Baseline Altman Z"-Score Results

Table 6-1 presents the baseline results of the Altman Z"-score analysis, grouped according to firm type (single-facility and multifacility). The table presents the total number of firms in each of the Z"-score categories (i.e., "bankruptcy likely," "indeterminate," and "bankruptcy unlikely"), as well as the total number of firms in each Z"-score category broken down by revenue groups. As stated previously, an Altman Z"-score below 1.1 indicates that bankruptcy is likely; a score above 2.6 indicates that bankruptcy is unlikely. Z"-scores between 1.1 and 2.6 are indeterminate.

The results in Table 6-1 indicate that single-facility firms have the greatest likelihood of bankruptcy in the baseline, with nearly 19 percent of firms (but only 12 percent of nonexcluded firms) facing potential bankruptcy prior to the imposition of any regulatory costs.[25] Additionally, among single-facility firms, EPA predicts that firms with less than $1 million in revenues will experience the largest number of bankruptcies in the baseline. Based on these results, note that multifacility firms appear less likely to fail in the baseline analysis than single-facility firms.

EPA analyzed a total of 681 firms (612 single-facility firms and 70 multifacility firms) in the postcompliance analysis, the results of which are discussed in Section 6.3.2. These numbers include firms in the small industrial laundries exclusion but do not include any that close or fail in the baseline. Of the firms considered in the postcompliance analysis, a number of firms fall in the "indeterminate" category after complying with the IL Standards. EPA considers these firms to be viable operations in marginal financial health; as such, these firms are discussed separately in Section 6.3.3.

[25] Note that 96 single-facility firms fail in the baseline because their facilities are predicted to close in the baseline facility-level analysis in Section Five. (As discussed above, single-facility firms that close in the baseline are assumed also to fail. Even if this assumption is not made, however, most of these 96 firms would fail based on the Altman Z" analysis.) Additionally, 33 single-facility firms are estimated to close in the postcompliance analysis presented in Section Five. These 33 firms have been removed from both the baseline and postcompliance analyses, as discussed earlier, to avoid double counting of impacts.

Table 6-1

Baseline Firm Failure Analysis- All Firms

Firm Size or Type	Bankruptcy Likely Z"<1.1		Indeterminate 1.1<Z"<2.6		Bankruptcy Unlikely Z">2.6	
	Number	Percentage of Revenue Group	Number	Percentage of Revenue group	Number	Percentage of Revenue Group
Multifacility Firms						
All Multifacility Firms	3	4.5%	8	11.4%	61	84.1%
By Revenue Group ($000)						
< $1 Million	0	0.0%	0	0.0%	2	100.0%
>= $1 and < $3.5 Million	0	0.0%	0	0.0%	5	100.0%
>= $3.5 and < $7 Million	0	0.0%	0	0.0%	8	100.0%
>= $7 and < $10.5 Million	0	0.0%	2	16.7%	8	83.3%
>= $10.5 Million	3	6.9%	7	13.8%	38	79.3%
Single-Facility Firms						
All Single-Facility Firms	155	18.6%	65	7.9%	610	73.5%
By Revenue Group ($000)						
< $1 Million	84	46.0%	34	18.5%	64	35.4%
>= $1 and < $3.5 Million	28	9.5%	11	3.7%	254	86.8%
>= $3.5 and < $7 Million	42	11.4%	18	7.6%	198	81.1%
>= $7 and < $10.5 Million	0	0.0%	0	0.0%	81	100.0%
>= $10.5 Million	1	0.0%	3	15.4%	14	84.6%

Note: Discrepancies in the number of facilities are due to rounding.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

6.3.2 Postcompliance Altman Z"-Score Results — "Bankruptcy Likely"

Table 6-2 presents the results of the postcompliance Altman Z" analysis for single-facility firms. As the table shows, all bankruptcies are expected to occur among firms with revenues under $1 million per year. Numbers of firms potentially facing bankruptcy (or loss of independent status) range from 22 firms under the OC option to 66 firms under the DAF option.

Table 6-3 presents the results of the postcompliance Altman Z" analysis for multifacility firms: no closures are expected.

Table 6-4 combines the results for the two types of firms. As the table shows, impacts range from 22 to 66 failures, or 3.3 percent to 9.7 percent of all firms depending on the option implemented. The preferred option, the CP option, is associated with 65 failures or 9.5 percent of all firms. Appendix E indicates firm-level impacts for all facilities including facilities handling less than 1 million pounds of total water-washed laundry per years and less than 255,000 pounds of shop and printer towels/rags annually, which are assigned compliance costs in the Appendix E analysis.

6.3.3 Postcompliance Altman Z"-Score Results — Change From Healthy to Indeterminate Status

Table 6-5 presents the results of an analysis looking at the numbers of facilities that change from Altman Z"-scores of greater than 2.6 (bankruptcy unlikely) to less than 2.6 but greater than 1.1 (status "indeterminate"). As the table shows, 49 to 79 firms change financial status in this manner, depending on option.[26] This result is considered an impact of the IL Standards, but is considered a lesser impact than bankruptcy, because these firms might not be on track to failure and probably have more time and flexibility to improve their financial condition than those firms whose scores fall in the "bankruptcy likely" category.

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[26]Impacts appear to decline with the relative costs of the options because more firms become failures under the costlier options and are no longer captured in this table. If firms failures are added to indeterminate results, OC would result in 101 failures and indeterminate, while CP, COMBO, and DAF would result in 114 failures and indeterminate.

Table 6-2

Firm Failure Analysis - Single-Facility Firms

Bankruptcies	OC	CP	COMBO	DAF
All single-facility firms (N=612)*				
Incremental bankruptcies	22	65	65	66
Percentage of all single-facility firms	3.7%	10.6%	10.6%	10.8%
Single-facility firms with revenues < $1 million (N=66)				
Incremental bankruptcies	22	65	65	66
Percentage of all single-facility firms	3.7%	10.6%	10.6%	10.8%
Percentage of revenue group	34.0%	98.1%	98.1%	100.2%
Single-facility firms with revenues >= $1 million and < $3.5 million (N=263)				
Incremental bankruptcies	0	0	0	0
Percentage of all single-facility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Single-facility firms with revenues >=$3.5 million and < $7 million (N=186)				
Incremental bankruptcies	0	0	0	0
Percentage of all single-facility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Single-facility firms with revenues >=$7 million and <$10.5 million (N=81)				
Incremental bankruptcies	0	0	0	0
Percentage of all single-facility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Single-facility firms with revenues >=$10.5 million (N=16)				
Incremental bankruptcies	0	0	0	0
Percentage of all single-facility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%

* Excluding baseline bankruptcies and postcompliance closures.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

Table 6-3

Firm Failure Analysis - Multifacility Firms

Bankruptcies	OC	CP	COMBO	DAF
All multifacility firms (N=70)*				
Incremental bankruptcies	0	0	0	0
Percentage of all multifacility firms	0.0%	0.0%	0.0%	0.0%
Multifacility firms with revenues < $1 million (N=2)				
Incremental bankruptcies	0	0	0	0
Percentage of all multifacility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Multifacility firms with revenues >= $1 million and < $3.5 million (N=5)				
Incremental bankruptcies	0	0	0	0
Percentage of all multifacility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Multifacility firms with revenues >=$3.5 million and < $7 million (N=8)				
Incremental bankruptcies	0	0	0	0
Percentage of all multifacility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Multifacility firms with revenues >=$7 million and <$10.5 million (N=10)				
Incremental bankruptcies	0	0	0	0
Percentage of all multifacility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Multifacility firms with revenues >=$10.5 million (N=45)				
Incremental bankruptcies	0	0	0	0
Percentage of all multifacility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%

* Excluding baseline bankruptcies.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

Table 6-4

Firm Failure Analysis - All Firms

Bankruptcies	OC	CP	COMBO	DAF
All firms (N=681)*				
Incremental bankruptcies	22	65	65	66
Percentage of all firms	3.3%	9.5%	9.5%	9.7%
Firms with revenues < $1 million (N=68)				
Incremental bankruptcies	22	65	65	66
Percentage of all firms	3.3%	9.5%	9.5%	9.7%
Percentage of revenue group	33.0%	95.2%	95.2%	97.2%
Firms with revenues >= $1 million and < $3.5 million (N=268)				
Incremental bankruptcies	0	0	0	0
Percentage of all firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Firms with revenues >=$3.5 million and < $7 million (N=194)				
Incremental bankruptcies	0	0	0	0
Percentage of all firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Firms with revenues >=$7 million and <$10.5 million (N=91)				
Incremental bankruptcies	0	0	0	0
Percentage of all firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Firms with revenues >=$10.5 million (N=61)				
Incremental bankruptcies	0	0	0	0
Percentage of all firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%

* Excluding baseline bankruptcies and postcompliance closures.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

Table 6-5

Indeterminate Analysis - All Firms

Indeterminates	OC	CP	COMBO	DAF
All firms (N=681)				
Incremental indeterminates	79	49	49	48
Percentage of all firms	11.6%	7.3%	7.3%	7.1%
Firms with revenues < $1 million (N=68)				
Incremental indeterminates	32	1	1	0
Percentage of all firms	4.8%	0.2%	0.2%	0.0%
Percentage of revenue group	47.6%	2.0%	2.0%	0.0%
Firms with revenues >= $1 million and < $3.5 million (N=268)				
Incremental indeterminates	30	30	30	30
Percentage of all firms	4.4%	4.4%	4.4%	4.4%
Percentage of revenue group	11.3%	11.3%	11.3%	11.3%
Firms with revenues >=$3.5 million and < $7 million (N=194)				
Incremental indeterminates	15	17	17	17
Percentage of all firms	2.3%	2.5%	2.5%	2.5%
Percentage of revenue group	7.9%	8.6%	8.6%	8.6%
Firms with revenues >=$7 million and <$10.5 million (N=91)				
Incremental indeterminates	0	0	0	0
Percentage of all firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Firms with revenues >=$10.5 million (N=61)				
Incremental indeterminates	1	1	1	1
Percentage of all firms	0.2%	0.2%	0.2%	0.2%
Percentage of revenue group	1.8%	1.8%	1.8%	1.8%

Note: Discrepancies in the number of facilities are due to rounding.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

SECTION SEVEN

NATIONAL AND REGIONAL EMPLOYMENT IMPACTS AND TOTAL OUTPUT LOSSES

This section of the EA assesses the regional and national employment impacts of the proposed IL Standards. It also discusses output losses to the national economy induced by revenue losses in the industrial laundries industry. Only impacts from PSES options are discussed here;[1] Section Five discusses impacts from PSNS options.

EPA examines national-level employment losses and gains that will occur throughout the economy in response to the reallocation of expenditures caused by implementation of the IL Standards. EPA also examines the losses of employment in the national-level economy that result from employment losses due to postcompliance facility closures in the industrial laundries industry. Additionally, because closures can overstate total employment losses over time (since nonclosing facilities might expand production to take over some of the lost production of closing facilities, if not capacity constrained, or new sources might be started up), EPA also estimates longer-term employment losses occurring in the industrial laundries industry alone. These losses are tempered by gains within that industry (due to direct hiring of pollution control equipment operators within the industry)[2] and by cost passthroughs to customers,[3] so EPA calculates a net direct loss of employment in this analysis. Finally, EPA examines regional-level losses to determine impacts on communities.

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[1]There are no costs associated with Best Practicable Control Technology (BPT), Best Conventional Pollutant Control Technology (BCT), Best Available Control Technology Economically Achievable (BAT), or New Source Performance Standards (NSPS), since EPA is reserving limitations applicable to direct dischargers.

[2]Note that many of these operators may be transferred at least in part from production jobs at industrial laundry facilities (Knight, Lynn, ERG, 1993. "Interview and site visit with Brian Keegan, Unifirst," June 10. CBI material in the Rulemaking Record.)

[3]The analysis using cost passthrough does not change the impacts on the national level employment. Losses that do not occur in the industrial laundries industry would occur in the customer industries. This analysis using cost passthrough is EPA's best estimate of losses occurring in the industrial laundries industry *alone*. Note that any losses occurring in customer industries would not be large; this finding is discussed in more detail in Section 7.1.3.4

Pollution control expenditures divert investment away from production by industrial laundries (production in this context is economic terminology meaning "production" of industrial laundering services), which leads to direct employment losses and to a reduction in industrial laundry production. These losses are offset by gains in employment and production in the firms that manufacture the pollution control equipment and by gains in employment related to installing and operating the equipment. Some of these gains might even occur in the industrial laundries industry itself. These gains and losses can be measured using input-output (I-O) analysis. When losses and gains are netted, the overall losses to the U.S. economy are at most only 0.005 percent of national-level employment—see Section 7.1.3.

To compute either regional- or national-level employment changes, output effects or direct employment losses such as facility closures must be considered. Output loss, as defined for the purposes of I-O analysis, is measured as the total production loss multiplied by the unit price of that production (price per pound of laundry), or the gross revenue loss to the industry. Industrial laundry investments in compliance equipment and the operation of the equipment translate directly into output losses in the industrial laundries industry (assuming none of these costs is passed through to customers);[4] that is, the costs of compliance equal the output losses, which is consistent with economic theory under a zero cost passthrough scenario (perfectly elastic demand curve—see Appendix A).[5] Declines in production at industrial laundries affect the

[4] In this section on national-level impacts, EPA assumes that no part of the cost of the regulation can be passed through to customers, since the Agency does not have sufficient data to model output and employment losses among the customer industries. Because the industrial laundries industry tends to be considerably more labor-intensive than many of its customers, this assumption should provide a high-end estimate of employment impact throughout the economy. (The labor intensity of the industry is what drives the numbers of employees per million dollars of output). Later, EPA looks at impacts in the industrial laundries industry using the assumptions of cost passthrough, both in an output-based analysis and in a closure-based analysis (closures are driven by the facility model, which incorporates the cost passthrough assumptions). EPA uses cost passthrough assumptions to estimate impacts in the industrial laundries industry alone because the Agency strongly believes that a zero cost passthrough assumption is not realistic, as discussed in Section Five of this EA. For the national-level analysis, whether cost passthrough is assumed or not makes little difference, since all impacts to all industries are accounted for (the passthrough analysis only affects an estimate of impacts in the industrial laundries industry alone).

[5]When the demand curve is perfectly elastic, the output loss, which is a function of the unit cost of compliance (cost of compliance per pound of laundry processed), simplifies to Output = (Total Cost of Compliance/Initial Quantity of Production) * Initial Quantity of Production. Thus output loss further simplifies to the total cost of compliance. Appendix A discusses some of these equations in more detail. This assumption will hold as long as the supply curve is roughly unitary (neither very elastic nor very inelastic). Although supply in this case is somewhat inelastic, it is still close enough to unitary for these

(continued...)

revenues of input industries (industries that supply goods and services to the industrial laundries industry). These shifts in turn eventually result in a reduction of household consumption by workers in both industrial laundries and input industries, decreasing demand for consumer products at the national level. Direct employment effects such as employment losses from postcompliance facility closures also can be used to derive national- and regional-level impacts using direct-effect multipliers. Impacts on the industrial laundries industry are known as direct effects, impacts that continue to resonate through the economy are known as indirect effects (effects on input industries), and effects on consumer demand are known as induced effects. Such effects are tracked both nationally and regionally in massive I-O tables prepared by the U.S. Department of Commerce's Bureau of Economic Analysis (BEA). For every dollar spent in a "spending industry" (or for every employment change in the directly affected industry), these tables identify the portion spent (or every employment change) in contributing or vendor industries and the portion spent by consumers (or employment change as a result of a change in consumption).

For example, as a result of the IL Standards, an industrial laundry might purchase equipment to meet the standards equivalent to chemical precipitation. One piece of this equipment could be a tank to hold wastewater. To make the tanks, the manufacturer would purchase stainless steel. The steel manufacturer would purchase iron ore, coke, energy sources, and other commodities. Thus a portion of a dollar spent by the industrial laundries industry becomes a smaller portion of a dollar spent by the tank manufacturer, and a smaller portion of a dollar spent by the steel manufacturer, and so on. These iterations are captured in BEA's I-O tables and summarized as regional and national multipliers for output (revenues). BEA also has determined average wages and the proportion of output in each industry that goes to employee earnings and, as a result, the number of employees or full-time equivalents (FTEs)[6] associated with each $1 million change in output. I-O analysis provides a straightforward framework as long as the direct effects to the industry are small and certain limiting assumptions about technology are valid (e.g., constant returns to scale and fixed input ratios).

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[5](...continued)
purposes, but will result in an overstatement of impact. The loss of output occurs because the industry supply curve shifts up over all points in the curve. The industry supply curve is the aggregation of all facilities' marginal cost curves, which increase at every point when pollution control costs are added to production costs (see Figure A-1 in Appendix A). As noted in Appendix A, however, this upward shift is very small, accounting for a 0.3 percent reduction in production.

[6] One FTE = 2,080 labor hours = 1 person-year of employment.

As noted above, I-O analysis uses the multipliers derived by BEA to determine both output and employment effects. There are national-level multipliers and regional-level multipliers. National-level multipliers used here include final-demand output multipliers (which are used to estimate total U.S. economy effects when output changes in a specific industry), final-demand employment multipliers (which are used to estimate the change in total U.S. employment when output changes in a specific industry), and direct-effect employment multipliers (which are used to estimate the change in U.S. employment given a change in employment in a specific industry). The regional multipliers used here are direct-effect employment multipliers (which are used to estimate a state-wide change in employment given a change in employment in a specific industry in a specific state). These multipliers will be discussed in more detail below.

The analysis of employment and output losses (as well as related impacts) is divided into two parts. Section 7.1 analyzes the national-level impacts of the IL Standards on both labor and output using both direct output effects and direct employment effects. It also discusses the net, direct impacts on the industrial laundries industry based on reductions in production estimated by EPA's market model. Section 7.2 examines the regional impacts associated with employment losses and presents the methodology and results of the employment loss and community-level impact analyses. Note that the net change in employment at the national level includes the regional-level losses (i.e., national and regional losses are not additive).

7.1 NATIONAL-LEVEL OUTPUT AND EMPLOYMENT IMPACTS

7.1.1 Introduction

To comply with the IL Standards, facilities might need to install and operate pollution control systems. The costs for these systems reduce output and employment in the industrial laundries industry and increase output and employment in the sectors that manufacture, install, and operate pollution control equipment.

Despite the fact that employment losses and gains associated with pollution control expenditures tend to act as counterbalances, there are differences in the national-level economy under baseline and postcompliance scenarios. Baseline and postcompliance labor effects differ primarily because the industrial laundries industry is substantially more labor-intensive than the various pollution control industries.

Furthermore, the output multiplier for the industrial laundries industry is greater than those for the pollution control industries, so output losses might exceed output gains.

7.1.2 Methodology for Estimating National-Level Output and Employment Impacts

EPA estimates two categories of national-level impacts associated with the IL Standards: impacts on output in the economy as a whole (in dollars) and impacts on national employment (in FTEs). Also discussed in this section is the method for determining direct employment losses occurring in the industrial laundries industry alone, based on changes in output in the industry and derived using EPA's market model.

7.1.2.1 National-Level Output Losses and Gains

The loss in national-level output associated with output loss in the industrial laundries industry is estimated using the pretax capital and O&M costs of compliance (not adjusted for cost passthrough), which were presented in Section Four, Table 4-3, for each of the regulatory options. The pretax costs are used because I-O multipliers are based on changes in revenues, which are pretax numbers.

BEA industry 72.0201, which corresponds to SIC 721 and 725 (laundry, cleaning, garment services, and shoe repair), is the detailed industry category that most closely matches the industrial laundries industry. The national-level output multiplier estimated by BEA for this industry grouping is 3.7134 (RIMS II National Multipliers).[7] This multiplier represents the total dollar change in national output for all industries for each dollar change in the output of the industrial laundries industry. Using the BEA multiplier and the output loss to the industry given a zero cost passthrough (CPT) assumption[8] (equivalent to the pretax

[7] U.S. Department of Commerce, 1992. Table A-2.4—Total Multipliers, by Industry Aggregation, for Output, Earnings, and Employment. *Regional Input-Output Modeling System (RIMS II)*. Washington, DC: BEA, Regional Analysis Division, (RIMS II National Multipliers).

[8] As noted earlier, at the national level it makes little difference whether cost passthrough is assumed or not, since impacts are being estimated over the entire economy, not just over the industrial laundries industry. If cost passthrough is assumed, the output effects based on output effects on customer industries would need to be estimated and added to output effects resulting from output changes in the industrial

(continued...)

compliance costs to the industry, as discussed above), EPA estimates losses throughout the national economy in the following way:

Option Compliance Cost x 3.7134 = National-Level Output Loss

This approach might somewhat overstate output losses because no cost passthrough has been assumed and because the output multiplier for the industrial laundries industry tends to be greater than that for many of the customer industries (that is, if EPA had assumed cost passthrough and had apportioned output losses to customer industries, the overall national-level loss calculated would most likely have been less).

EPA also estimates the output gains in the economy using the following output multipliers[9] for the pollution control industries:

- For capital material costs: BEA Industry 42.0800 (pipes, valves, and pipe fittings); BEA Industry 40.0600 (fabricated plate work);[10] and BEA Industry 49.0100 (pumps and compressors), with a weighted output multiplier of 3.0516.[11] Capital material costs are assumed to be 85 percent of the total capital costs estimated for each option.
- For installation costs: BEA Industry 11.0000 (construction — new and maintenance and repair), with a multiplier of 3.1957. Installation costs are assumed to be 15 percent of total capital costs estimated for each option.
- For operating costs: (1) Labor: BEA Industry 72.0201 (laundries), with a multiplier of 3.7134 (assumes that operators for pollution control equipment will be hired by the affected industry); (2) Materials: BEA Industry 27.0406 (chemical and chemical preparations, not elsewhere classified) with a multiplier of 2.9083; (3) Energy: BEA Industry 68.0100

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[8](...continued) laundries industry.

[9] *Ibid.*

[10] Includes tanks.

[11] The weighted multiplier is developed assuming that 20 percent of capitol costs is piping, 10 percent is pumps, and 70 percent is tanks. These breakdowns, as well as those discussed in the following bullets, are developed on the basis of discussions with EPA's technical contractor (telephone conversation between Anne Jones, Eastern Research Group, Lexington, MA, and Wendy Grome, Eastern Research Group, Herndon, VA, June 3, 1997). These same assumptions are applied to the development of the employment multiplier breakdown discussed later.

(electric services [utilities]), with a multiplier of 2.2370. Labor, materials, and energy costs are assumed to make up one-third each of operating costs.

Gains are calculated using the cost share assigned to an industry (e.g., O&M cost/3 x 2.9083 = national-level output gain associated with the materials portion of O&M cost). When all the gains associated with pollution control industries are aggregated, EPA can estimate the total output gains attributable to the IL Standards. To determine a net loss or gain, EPA then compares the losses and gains in the economy.

7.1.2.2 National-Level Employment Losses and Gains

In calculating national-level employment impacts, the Agency first uses a similar approach to that used to calculate output effects. Based on industrial laundries industry output, BEA (RIMS II National Multipliers) has estimated a final-demand multiplier for national-level employment of 83.3. This number represents the total change in the number of jobs in all industries nationally for each $1 million change in output delivered to final demand by the industrial laundries industry.[12] Therefore, to calculate employment impacts, EPA divides the output loss of the industrial laundries industry, measured as the annual pretax compliance cost, by $1 million and multiplies this figure by BEA's employment multiplier.[13]

EPA believes that this approach will yield a worst-case estimate of employment losses nationwide because the Agency is assuming costs are not passed through to customers. Customer industries generally have much lower multipliers (on the basis of number of employees per $1 million output). Customer multipliers are easily half of the 83.3 employees per $1 million output of the industrial laundries industry.[14]

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[12]Employment impacts calculated using a final-demand multiplier include direct, indirect, and induced effects.

[13] Losses are deflated to 1992 dollars because BEA's national multipliers are based on 1992 data. EPA uses *Engineering News Record*, 1997. "Construction Cost Index," March 31, for deflating.

[14] The difference in output multipliers between the industrial laundries and its customer industries is not so extreme, thus the overestimate of the national-level employment loss may be proportionately greater than the overestimate of the national-level output loss.

A lower bound estimate of impact on employment can be achieved by using total postcompliance closures and the employment associated with those closures, multiplied by the national-level, direct-effect employment multiplier of 1.7201. As the Agency will show later in this section of the EA, using closures as the direct employment loss is appropriate for identifying the likely immediate direct losses in the industry because employment losses from closures under most options exceed the predicted, longer-term losses from production declines (see Appendix A and Section 7.1.3.3). That is, using employment losses from closures will not underestimate immediate direct employment losses in the industry. This estimate, however, could understate employment losses in the customer industries. Thus, the actual losses to the U.S. economy probably lie between these two estimates.

Employment gains are estimated using the final-demand multipliers for each of the pollution control industries listed above. These multipliers are:

- For capital material costs: BEA Industry 42.0800 (pipes, valves, and pipe fittings); BEA Industry 40.0600 (fabricated plate work); and BEA Industry 49.0100 (pumps and compressors), with a weighted average final-demand employment multiplier of 31.4.[15]
- For installation costs: BEA Industry 11.0000 (construction — new and maintenance and repair), with a multiplier of 21.5.
- For operating costs: (1) Labor: BEA Industry 72.0201 (laundries), with a multiplier of 83.3 (assumes that operators for pollution control equipment will be hired by the affected industry); (2) Materials: BEA Industry 27.0406 (chemicals and chemical preparations, not elsewhere classified) with a multiplier of 23.7; and (3) Energy: BEA Industry 68.0100 (electric services [utilities]), with a multiplier of 15.8.

EPA computes employment gains by multiplying the appropriate industry shares of the pollution control costs times the appropriate multiplier. After aggregating all gains, EPA compares national-level losses and gains to compute the net employment change resulting from the IL Standards. This net change can then be compared to national-level employment to gauge the magnitude of employment impacts on the national economy.

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[15]Weighting is the same as that used for the output gains analysis.

7.1.2.3 Total Direct Long-Term Employment Losses in the Industrial Laundries Industry

As noted above, the gross employment losses calculated using output effects overstate employment losses. Furthermore, closures and their associated employment losses are immediate effects that might overstate or understate losses over the longer term when market equilibrium is reached. Therefore, EPA also must determine whether employment losses from nonclosing facilities occur, or whether some employment (and production) gains accrue to nonclosing facilities. EPA thus conducts another employment loss analysis that allows net losses to be computed. This analysis is based on output effects estimated using EPA's market model and on gains in labor associated with operating pollution control eaquipment. The analysis uses the estimated production losses calculated using the market model valued at the current price to reflect the reduction in output that would affect employment in the industrial laundries industry alone.[16] EPA can then compute the direct employment losses in the industrial laundries industry alone (losses in customer industries and gains in pollution control industries are excluded, as are additional indirect and induced losses and gains). To do this, EPA first calculates output loss using the loss of production calculated using the market model (see Appendix A, Table A-3) valued at current price. As with the national-level analysis described above, employment losses in the industry might be offset by employment gains, because it is likely industrial laundries will hire workers (or transfer workers from productive operations) to operate the pollution control equipment installed. However, since industrial laundries might opt to contract out the operation of pollution control equipment (and thus another industry might be credited with some of the employment gains), EPA makes the conservative assumption that 50 percent of the labor component of the operating costs of compliance does not contribute to employment gains within the industrial laundries industry.[17]

This output loss can then be converted to total employment losses using the BEA multiplier of 83.3 FTEs per $1 million change in the output for the industrial laundries industry, discussed above. The resulting figure includes all direct, indirect, and induced employment effects specifically related to changes in output in

[16] This approach is consistent with how the I-O tables are created; price is held constant, and output is allowed to vary.

[17] EPA assumed previously in the national-level analysis that all operating labor is industrial laundries employment because on a national level, it matters very little which industry is picking up the gains in employment associated with operating pollution control equipment, since any of the industries that might experience these gains have similar multipliers. It makes a substantial difference, however, in this analysis whether the industrial laundries industry or another industry is credited with these gains.

the industrial laundries industry alone. To estimate direct losses only (losses only in the industrial laundries industry), EPA multiplies total net employment losses by the inverse of the national-level direct-effect employment multiplier (1.7201). The direct-effect multiplier represents the change in total (direct, indirect, and induced) employment for each unit change in direct employment; its inverse, therefore, represents the direct employment change portion of total employment impacts. Direct losses can be compared to total industry baseline employment to gauge the magnitude of employment impacts within the industry. They can also be compared to losses associated with facility closures (as estimated in Section Five) to determine how many, if any, employees are lost at nonclosing facilities.

7.1.3 National-Level Output and Employment Impacts

7.1.3.1 National-Level Output Losses

Table 7-1 shows the total gross, national-level, worst-case output losses associated with the IL Standards. Using the output multiplier of 3.7134, national-level output losses are estimated to range from $222 million to $597 million per year, depending on option. The selected option, CP, is associated with an output loss of $461 million.

Table 7-2 shows the total gross national-level output gains associated with purchasing, installing, and operating pollution control equipment. The national-level output gains are estimated to total $179 million to $476 million per year with a net annual loss of national-level output of $43 million to $120 million per year, depending on option (see Table 7-3). The selected option, CP, is associated with a net, worst-case loss of $91 million per year. This is 0.001 percent of 1993 gross domestic product ($6.6 trillion),[18] thus EPA believes this loss will have a negligible effect on the national-level economy.

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[18] U.S. Government Printing Office, 1997. *Economic Report of the President, February, 1997.* Washington, DC: U.S. Government Printing Office.

Table 7-1

Annual National-Level Output Losses (millions, 1993 dollars)

Option	Total Estimated Output Loss in the Industrial Laundries Industry	Output Multiplier	National-Level Output Losses
OC	$59.65	3.7134	$221.50
CP	$124.11	3.7134	$460.87
COMBO	$132.04	3.7134	$490.32
DAF	$160.54	3.7134	$596.15

Source: Output loss is from U.S. EPA, 1997. IL Facility and Firm Financial Model (included in Rulemaking Record). Output multiplier is from U.S. Department of Commerce, 1992. Table A-2.4--Total Multipliers, by Industry Aggregation, for Output,Earnings and Employment. Regional Input-Output Modeling System (RIMS II). BEA, Regional Analysis Division.

Table 7-2

Annual National-Level Output Gains (millions, 1993 dollars)

Item	OC	CP	COMBO	DAF
Total Capital Cost (Annualized Over 16 Years at 7%)	$27.79	$45.00	$42.18	$34.87
Capital Materials Cost (85% of Total Cost)	$23.62	$38.25	$35.86	$29.64
Capital Materials Multiplier	3.0516	3.0516	3.0516	3.0516
Output Gain (Capital Materials)	$72.09	$116.72	$109.42	$90.44
Installation Cost (15% of Total Cost)	$4.17	$6.75	$6.33	$5.23
Installation Cost Multiplier	3.1957	3.1957	3.1957	3.1957
Output Gain (Installation)	$13.32	$21.57	$20.22	$16.71
Total O&M Cost	$31.64	$78.39	$89.09	$125.06
Labor Share (33.3%)	$10.55	$26.13	$29.70	$41.69
Labor Multiplier	3.7134	3.7134	3.7134	3.7134
Output Gain (Labor)	$39.16	$97.03	$110.28	$154.80
Materials Share (33.3%)	$10.55	$26.13	$29.70	$41.69
Materials Multiplier	2.9083	2.9083	2.9083	2.9083
Output Gain (Materials)	$30.67	$75.99	$86.37	$121.24
Energy Share (33.3%)	$10.55	$26.13	$29.70	$41.69
Energy Multiplier	2.237	2.237	2.237	2.237
Output Gain (Energy)	$23.59	$58.45	$66.43	$93.25
Total Output Gain	$178.85	$369.77	$392.71	$476.44

Source: Capital and O&M Costs are from EPA's Development Document. Multipliers are derived as discussed in the text of this report.

Table 7-3

Net Annual National-Level Output Losses Associated with IL Standards (millions, 1993 dollars)

Option	Total Annual Loss	Total Annual Gain	Net Loss in National-Level Output
OC	$221.50	$178.85	$42.66
CP	$460.87	$369.77	$91.10
COMBO	$490.32	$392.71	$97.61
DAF	$596.15	$476.44	$119.70

Source: Tables 7-1 and 7-2.

7.1.3.2 National-Level Employment Losses

Table 7-4 presents the national-level employment losses associated with the lost industrial laundries industry output. EPA converts the industry output losses into millions of 1992 dollars[19] and multiplies these losses by the employment multipliers to determine total annual employment losses of 4,754 to 12,795 FTEs, depending on option. The selected option, CP, is associated with employment losses of 4,940 to 9,892 FTEs, nationwide, over all industries. This is only 0.004 to 0.008 percent of total U.S. employment of 120.3 million persons in 1993.[20] It is important to note that these losses are not necessarily people, but hours, and, in fact, single individuals might not lose jobs, but rather might be faced with small reductions in hours worked. Over the entire U.S. employed population, this result would mean that each worker on average might lose 5 to 10 minutes of work a year. Given the wide distribution of impact likely to be associated with these losses, averaging them over the entire U.S. employed population is not an unrealistic approach.

Table 7-5 presents the national-level employment gains associated with the output gains in the pollution control industries. These gains total 2,035 to 5,896 FTEs, depending on option. The proposed option, CP, is associated with gains of 4,358 FTEs. This option is therefore associated with a net loss of 582 to 5,534 FTEs (see Table 7-6). National-level (civilian) employment in 1993 was 120.3 million persons.[21] This loss is thus 0.0005 to 0.005 percent of total national employment. On the basis of hours, this is 0.6 to 6 minutes per year per employed person in the U.S. on average. EPA therefore believes that the IL Standards will have a negligible impact on national-level employment.

7.1.3.3 Direct Employment Losses in the Industrial Laundries Industry

As noted above, the losses associated with postcompliance facility closures could overstate or understate longer-term losses in the industrial laundries industry. The actual output loss, calculated for the industrial laundries industry using production losses estimated in Appendix A, is $11 million to $29 million

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[19] BEA's RIMS II National Multipliers are based on 1992 data.

[20] U.S. Government Printing Office, 1997. *Op. cit.*

[21] *Ibid.*

Table 7-4

National-Level Employment Losses (FTEs)

Option	Total Annual Output Loss in the IL Industry ($ MM 1993)	Loss in 1992 Dollars ($ MM 1992)	Output Employment Multiplier	Total Output-Based FTE Loss	Employment Losses Based on Facility Closures	Direct Effect Employment Multiplier	Total Closure-Based FTE Loss
OC	$59.65	$57.07	83.3	4,754	227	1.7201	390
CP	$124.11	$118.75	83.3	9,892	2,872	1.7201	4,940
COMBO	$132.04	$126.34	83.3	10,524	2,872	1.7201	4,940
DAF	$160.54	$153.60	83.3	12,795	3,003	1.7201	5,165

Source: Output loss is from Table 4-3. Employment multiplier is from U.S. Department of Commerce, 1992. Table A-2.4--Total Multipliers, by Industry Aggregation, for Output, Earnings and Employment. Regional Input-Output Modeling System (RIMS II). BEA, Regional Analysis Division.
1993 dollars are deflated to 1992 dollars using the Engineering News Record's Construction Cost Index (0.9568).

Table 7-5

National-Level Employment Gains (FTEs) (1992 Dollars)

Item	OC	CP	COMBO	DAF
Total Capital Cost (Annualized over 16 years at 7%)	$26.59	$43.05	$40.36	$33.36
Capital Materials Cost (85% of total cost)	$22.60	$36.60	$34.31	$28.36
Capital Materials Employment Multiplier	31.4	31.4	31.4	31.4
Employment Gain (Capital Materials)	710	1,149	1,077	890
Installation Cost (15% of total cost)	$3.99	$6.46	$6.05	$5.00
Installation Cost Employment Multiplier	21.5	21.5	21.5	21.5
Employment Gain (Installation)	86	139	130	108
Total O&M Cost	$30.27	$75.00	$85.24	$119.66
Labor Share (33.3%)	$10.09	$25.00	$28.41	$39.89
Labor Employment Multiplier	83.3	83.3	83.3	83.3
Employment Gain (Labor)	841	2,083	2,367	3,322
Materials Share (33.3%)	$10.09	$25.00	$28.41	$39.89
Materials Employment Multiplier	23.7	23.7	23.7	23.7
Employment Gain (Materials)	239	593	673	945
Energy Share (33.3%)	$10.09	$25.00	$28.41	$39.89
Energy Employment Multiplier	15.8	15.8	15.8	15.8
Employment Gain (Energy)	159	395	449	630
Total Employment Gain	2,035	4,358	4,697	5,896

Source: Capital and O&M Costs are from EPA's Development Document. Multipliers are derived as discussed in the text of this report.

Table 7-6

Net Annual National-Level Employment Losses Associated with IL Standards (FTEs)

Option	Total Annual Losses Based on Output	Total Annual Losses Based on Closures	Total Annual Gain	Net Loss in National Level Employment Based on Output	Net Loss in National-Level Employment Based on Closures
OC	4,754	390	2,035	2,719	(1,644)
CP	9,892	4,940	4,358	5,534	582
COMBO	10,524	4,940	4,697	5,827	244
DAF	12,795	5,165	5,896	6,899	(731)

Source: From Tables 7-4 and 7-5.

annually (1992 dollars) or 0.1 percent to 0.4 percent of the $7.5 billion in industrial laundries revenues (see Section Three). This output loss would result in a nationwide employment loss of 894 to 2,386 FTEs, depending on option, associated with output losses occurring strictly in the industrial laundries industry based on the final-demand employment multiplier of 83.3 FTEs per $1 million output change (see Table 7-7).

These numbers, however, include the direct, indirect, and induced employment losses, (see beginning of Section Seven for definition) as well as losses that might be offset by gains within the industrial laundries industry. Employment gains expected due to the need to operate the pollution control equipment, as shown in Table 7-5, are estimated to be 841 to 3,322 FTEs. If 50 percent of these gains are assumed to be employment gains in the industrial laundries industry itself, gains are estimated to range from 420 to 1,661 FTEs, depending on option (see Table 7-7). Thus the total net loss associated with industrial laundries (and still including direct, indirect, and induced losses) ranges from 474 to 809 FTEs, with the selected option associated with losses of 809 FTEs. Given this total loss of employment, the inverse of the direct-effect multiplier (i.e., 1/multiplier) can be used to calculate the direct employment losses. The direct-effect multiplier for the industrial laundries industry is 1.7201, which means that for every direct job loss, there are an additional 0.7201 indirect and induced job losses.[22] Thus the direct component of the losses calculated is estimated to range from 275 to 470 FTEs, which is 0.2 to 0.4 percent of the estimated 130,000 FTEs employed in the industrial laundries industry. The selected option is associated with direct losses of 470 FTEs in the industrial laundries industry, or 0.4 percent of total employment (see Table 7-7), or an average of about 8 hours per year per person employed in the industrial laundries industry. As will be discussed in Section 7.2, these are only a fraction of the employment losses expected from closures when total weighted employment at the 33 closing facilities is summed, leading EPA to conclude that some nonclosing facilities might experience employment gains.

7.1.3.4 Impacts on Customer Industries

It is useful to note that even if all worst-case losses (not net of gains) estimated for the CP option, totaling 9,892 FTEs, are assumed to fall on customer industries only, these losses are only 0.02 percent of employment in the top 15 customer industries, which have a total employment of 58.4 million (see Table 3-6

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[22] RIMS II National Multipliers.

Table 7-7

Direct Employment Losses in the Industrial Laundries Industry (FTEs)

Option	Annual Post compliance Quantity Loss (million lbs.)	Precompliance Price per Pound	Output Loss 1992 Dollars	Final-Demand Employment Multiplier	Total FTE Loss	Total FTE Gain	Net Total FTE Loss	Net Direct FTE Loss	Percent of IL Industry Employment
OC	13.85	$0.81	$10.73	83.3	894	420	474	275	0.21%
CP	28.66	$0.81	$22.21	83.3	1,850	1,041	809	470	0.36%
COMBO	30.47	$0.81	$23.61	83.3	1,967	1,183	784	456	0.35%
DAF	36.96	$0.81	$28.64	83.3	2,386	1,661	725	421	0.32%

Source: Quantity Loss is from Table A-3 in Appendix A of this report. Precompliance price per pound and total employment are from Section 308 Survey data. The final-demand employment multiplier is from U.S. Department of Commerce, 1992. Table A-2.4--Total Multipliers, by Industry Aggregation, for Output, Earnings, and Employment. Regional Input-Output Modeling System (RIMS II). BEA, Regional Analysis Division. Total FTE Gain is from Table 7-5, with adjustments as described in the text.

Net Direct FTE Loss uses the direct-effect employment multiplier, 1.7201, from the same BEA source as above.

in Section Three of this EA). In terms of average numbers of hours lost, this result might mean less than one-half hour per person lost per year on average in the customer industries.

7.2 REGIONAL EMPLOYMENT IMPACTS

7.2.1 Introduction

In the previous section, EPA estimated the employment impacts associated strictly with the industrial laundries industry, subtracting out employment losses that were expected to be offset by gains for operating pollution control equipment within the industry and calculating the direct-effect loss only.[23] EPA estimated this direct-effect loss to range from 275 to 470 FTEs, depending on the option. The selected option, CP, is associated with a direct loss of 470 FTEs.

Some portion of these employment losses likely will occur at facilities that are expected to close in the postcompliance analysis (see Section Five). As noted in this section, up to 33 facilities are expected to close, depending on option. These 33 facilities are associated 2,872 FTEs. The total number of FTEs associated with facility closures is estimated to range from 227 to 3,003 FTEs depending on option, based on the analysis in Section Five and on Section 308 Survey data on employment at closing facilities (see Table 7-8).[24] The number of FTEs lost at closing facilities under CP, COMBO, and DAF options exceeds the number of FTEs determined likely to be lost in Section 7.1.3.3 (275 to 470 FTEs); thus, EPA concludes the FTEs lost because of closures may be offset by gains at other industrial laundries facilities that take over some of the output (production) lost by the closing facilities, barring capacity constraints. EPA uses the total estimated losses (470 FTEs under the CP option) as the estimated long-term impact on the industry and the

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[23] The only employment gains assumed to offset losses at the regional level are those associated with the labor required to operate pollution control systems. All other gains are assumed to be unlikely to occur either in the same locations as losses or at the same time as losses (e.g., immediate hiring of laid-off workers by other industrial laundry facilities in the area might not occur).

[24] EPA does not identify losses associated with bankruptcies identified in the firm-level analysis, since these impacts occur only among single-facility firms that do not close in the facility-level analysis. Because these firms are viable facilities, EPA assumes they will be sold as viable businesses and will lose few if any employees (see discussion in Section Six for why EPA believes this industry is likely to have few employment losses associated with firm failures).

Table 7-8

Direct Employment Losses at Closing and Nonclosing Facilities

Option	Total Employment Losses	Employment Losses at Closing Facilities	Employment Gains (Losses) at Nonclosing Facilities	Average Gains (Losses) at Nonclosing Facilities
OC	275	227	(48)	(0.0)
CP	470	2,872	2,402	1.5
COMBO	456	2,872	2,416	1.5
DAF	421	3,003	2,582	1.6

Source: Table 7-7 and Section 308 Survey data on numbers of FTEs at closing facilities. Closing facilities are identified by EPA, 1997. IL Facility and Firm Financial Model.

losses (470 FTEs under the CP option) as the estimated long-term impact on the industry and the losses estimated for closures (2,872 FTEs) as the estimated short-term impact on the industrial laundries industry.

According to the results of this calculation, for most of the options, the "average" nonclosing facility will gain, not lose, production and employment (given no capacity constraints). Gains, however, probably will not be spread evenly among nonclosing facilities, but are more likely to occur in the same market areas as facility closures, because while demand is not likely to change in the area, supply could initially drop substantially as a result of a closure. Depending on option, for all *nonclosing* facilities, the change in employment will range from a loss of 48 FTEs to a gain of 2,582 FTEs. The CP option is associated with direct gains of 2,402 FTEs at nonclosing facilities (see Table 7-8).

The losses that might have some measurable effect at the community level are those associated with closures, because these losses tend to be larger and possibly could be concentrated in one location and because nonclosing facilities might not lose employment under most options. EPA is concerned with the impacts of dislocation, even if other laundries in the region hire the displaced workers from closing facilities (most likely after some delay); thus the analysis discussed below uses the full loss of employment at closing facilities to assess community-level impacts.

7.2.2 Regional-Level Impacts Methodology

The employment losses of concern in the regional-level analysis consist of employee layoffs associated with the facility closures estimated in the facility closure analysis. Section 308 Survey data on annual employment hours is used to calculate direct employment losses associated with facility closures resulting from the IL Standards on an FTE basis.

These losses are those direct employment losses associated with the IL Standards that might have a significant impact on a region's economy. The direct employment losses, however, are only a fraction of the employment losses that might affect a region's economy; as discussed earlier, there are indirect and induced losses of employment also to consider. These indirect and induced losses can be estimated on a regional basis using BEA multipliers for the affected state. Note, however, that because these multipliers are derived for an entire state, they will most likely overstate the impacts within a smaller region (e.g., county or metropolitan statistical area [MSA]). The specific multiplier used is the direct-effect multiplier for the state in which the surveyed closure occurs.

The direct-effect multiplier shows the number of total jobs lost in all industries given one job lost in the subject industry. For example, BEA tables show that one job lost in the industrial laundries industry in the state of California will result in a total of 1.5119 jobs lost in all industries throughout the state. Thus the calculation is:

Direct Employment Loss x Direct-Effect Multiplier = Total Direct, Indirect, and Induced Losses

Because the Section 308 Survey does not indicate the precise location of the facilities statistically represented by a surveyed facility, the Agency assumes, first, that all facilities represented by a closing facility are located in the same county or MSA (defined by OMB) in which the surveyed facility is located. This is not a realistic assumption, so EPA continues with a further analysis, described below.

The significance to the community of employment losses is measured by their impact on the community's overall level of employment. Data necessary to determine the community impact include the community's total labor force and employment rate. The community employment information used in this analysis is from the Census Bureau's web page,[25] as estimated by the Bureau of Labor Statistics. For the purposes of this analysis, the community is defined as the MSA (if urban) or county (if rural) in which the facility is located and is assumed to represent the labor market area within which residents could reasonably commute to work. An increase in the unemployment rate equal to or greater than 1 percent (e.g., from a 5 percent to a 6 percent unemployment rate) is considered significant. The change in the unemployment rate is computed as:

Current Unemployment Rate-[(Current Unemployment + Postcompliance Employment Losses)/Labor Force]

If a community's unemployment rate is expected to increase more than 1 percent solely because of the effect of statistical weighting, EPA undertakes one additional level of analysis. The Agency investigates the locations of facilities in the surveyed facility's sampling frame. EPA's two screener surveys captured

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[25] Http://www.census.gov/statab/USA96.

information on facility location. As long as facilities in the sampling cell represented by the surveyed facility are located in geographically diverse areas, the Agency concludes the regulation will not have a significant impact on the communities.

7.2.3 Results of the Regional-Level Community Impact Analysis

Table 7-9 presents the total number of closing facilities surveyed in the Section 308 Survey, their weight, and the state in which they are located, along with the appropriate direct-effect multiplier for the state. The total number of direct employment losses and total (direct and other) losses are also presented. As the table shows, the largest losses tend to occur in large urban areas, where the impact on employment is relatively dilute. The change in the unemployment rates ranges from 0.01 to 3.42, depending on which facilities close. The greatest change in the unemployment rate, 3.42 percent, is associated with Facility 5, which closes under all options except OC. This facility, however, would only cause the unemployment rate to change by more than 1 percent if all 30 facilities it represents are located in the same community. EPA investigated the locations of the other facilities in this facility's sampling frame cell and determined that they were geographically diverse. EPA investigated 109 out of the 121 facilities in the cell represented by the surveyed facility (which was one of four sampled in this cell). No more than three facilities in this sampling frame were found to be located in the same county or MSA. Nearly all facilities were located in small urban to very large urban areas. Where two or three facilities were located in the same county or MSA, the location tended to be a large urban area. Note that none of the facilities in this cell that were located in Missouri were located within the same county. Therefore, EPA concludes that impacts in any one community are likely to be no more than about a tenth of the impact shown in Table 7-9 for Facility 5. The Agency thus concludes, given this finding and given that all other facility closures result in changes in the unemployment rate of substantially less than 1 percent, that none of the regulatory options would have a noticeable impact on the affected communities.

Table 7-9

Regional-Level Community Impact

Facility	Number of Employees	Options Facility Closes Under	Survey Weight	Direct Losses	State	State Multiplier	Total Losses	Change in Unemployment Rate
Facility 1	116	OC, DAF	1	131	MD	1.4092	185	0.04%
Facility 2	70	OC	1	96	KY	1.5031	144	0.32%
Facility 3	29	CP, COMBO, DAF	1	40	WI	1.3909	56	0.03%
Facility 4	14	CP, COMBO, DAF	1	19	CT	1.4313	27	0.01%
Facility 5	93	CP, COMBO, DAF	30	2,813	MO	1.423	4,003	3.42%

*(Current unemployment + postcompliance losses)/labor force.

Note: Labor force and unemployment numbers and unemployment rates are not presented here to protect confidentiality of facilities projected to close.

Sources: Regional Multipliers: U.S. Department of Commerce, 1992. A User Handbook for the Regional Input-Output Modeling System (RIMS II). Economics and Statistics Administration, Bureau of Economic Analysis. Second Ed., May. County Labor data obtained at http://www.census.gov/statab/usa96. The most recent year for which BLS data are available is 1991.

SECTION EIGHT
OTHER IMPACTS

8.1 INTRODUCTION

In this section of the EA, EPA investigates other potential impacts associated with the IL Standards, including impacts on markets, both foreign and domestic, impacts on the customers of industrial laundries services (including the potential for customers to substitute other products for industrial laundries services), impacts on establishments other than industrial laundries that might launder industrial textile items from offsite sources, impacts on inflation, and distributional impacts and environmental justice (which addresses who is ultimately bearing the costs and reaping the benefits of the regulation).

8.2 IMPACTS ON MARKETS

8.2.1 Impacts on Foreign Markets/Trade

Unlike a manufacturing industry, the industrial laundries market, with a few exceptions, is made up of numerous small, local market areas, with facilities each having a distinct radius of service, limited by the cost of transportation. Thus impacts on foreign markets and trade are limited to areas of the United States that are near foreign borders. Most industrial laundries are located in small urban to large urban areas. This further limits the numbers of border localities likely to be served by industrial laundries, since most border areas in the United States are not associated with major urban centers, with a few exceptions such as the Seattle area, Southern California, the Detroit area, and El Paso, Texas. EPA thus believes that the number of industrial laundries facing foreign competition is very small.

A requirement to meet the IL Standards could put some industrial laundry facilities at a slight disadvantage relative to foreign facilities in certain border areas, but there are a number of factors likely to mitigate this disadvantage. It is likely that the U.S. and non-U.S. markets do not strongly overlap in border areas because the transaction costs of clearing customs can be high. Even in areas, such as in, say, Southern

California (San Diego/Tijuana), where border crossings are frequent, pickup and delivery of items across international boundaries could involve substantial paperwork, searches, and other delays.

Additionally, EPA's analysis of the impacts that would occur if no compliance costs can be passed through to customers, as discussed in Appendix D, shows that the vast majority of industrial laundries would not be affected even if costs could not be passed through (as in the case of a border facility trying to compete with industrial laundries that are not subject to the IL Standards). These impacts are at most two additional facility closures and 20 additional firm failures over all industrial laundry firms and facilities. Thus, although some small impact might be felt in certain limited market areas, EPA does not expect the IL Standards to have an impact on foreign markets or trade, given the limited involvement of this industry in foreign markets, given the relatively high transaction costs of doing business in international markets, and given the small number of additional impacts that might occur should a few industrial laundries absorb all compliance costs in attempting to compete with foreign laundries.

8.2.2 Impacts on Domestic Markets

In most areas where industrial laundries operate, the IL Standards would affect all facilities equivalently, in many cases "leveling the playing field." Currently, some facilities must meet stringent local limits, whereas other facilities, served by different POTWs, are not required to meet the same types of local limits. The IL Standards would tend to reduce some of the differences in operating costs now faced by many facilities in the same market areas.

The possible exception to this is the impact of the small industrial laundries exclusion, which will exclude some small facilities from meeting the requirements of the IL Standards, although they may have to meet local limits, thus eliminating any competitive advantage. Although the exclusion would allow some small facilities potentially to have a competitive edge in certain markets because they will face lower production costs than the nonexcluded facilities, the impact of this effect on the market is negligible. Of the 8.8 million pounds of laundry processed in 1993, only about 59 million pounds, or 0.7 percent were associated with facilities meeting the definition of the exclusion. Even if several of these excluded facilities are located in a market area, the combined market share of these excluded facilities would still likely be quite small. Because EPA's survey sampling frame was not stratified along geographic lines, the surveyed facilities representing the excluded population should be randomly distributed by geographic location, and that distribution should be fairly wide, considering the wide distribution, overall, of industrial laundry facilities nationwide (see Section Three). Furthermore, any competitive edge an excluded industrial laundries facility might have is self limiting—if a facility takes advantage of an edge, keeping its prices below its competition and expanding its business, the facility will size itself out of the exclusion. EPA expects that over time, through either growth or attrition, the number of excluded facilities will become smaller, and their already small effect on industrial laundry markets will become even less of a consideration.

8.3 IMPACTS ON INDUSTRIAL LAUNDRIES CUSTOMERS

8.3.1 Financial Profile of the Customer Base

As discussed in Section Three, a variety of customers purchase industrial laundries' services for a number of reasons. For some customers, particularly those in the manufacturing and automotive service industries and print shops, industrially laundered textiles facilitate workplace cleanliness; industrial laundries provide and launder protective clothing and employee uniforms, work materials (e.g., shop and print towels), and items geared towards soil minimization and removal (e.g., mats and mops). In addition, customers purchase industrial laundering services in the interest of enhancing employee appearance and corporate image and identity; especially in the service industries, uniform and mat rental programs promote company cohesion and brand recognition.

Because of the many different types of companies that use industrial laundries, it is not possible to develop a single financial profile of the industrial laundries customer base. Overall, the health of industrial laundries' customers is good. The service sector, in particular, has experienced a fair amount of growth in recent years. Despite some regional manufacturing job losses, moreover, the industrial laundries industry remains optimistic about prospects for future business from traditional, blue-collar customers.[1,2]

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[1] 1996. "Regional trend analysis shows pockets of potential." *Industrial Launderer*. October, p. 85-86, 88-89.

[2] 1996. "Job growth trends show industry's pockets of potential." *Industrial Launderer*. November, p. 53-54, 56, 58.

Table 8-1 contains average financial statistics for the 14 industry groups that correspond roughly to 14 of the 15 major industrial laundries customer groups discussed in Section Three.[3] The figures in the table are estimated based on corporate income tax return data provided by the Internal Revenue Service (IRS). Since such data does not reflect the financial situation at S corporations and sole proprietorships, the average costs and revenues calculated herein may be overstated, and total costs and revenues are understated.

8.3.2 Impacts of Price Increases on Customers

The costs of industrial laundering, like the costs of employee wages and benefits, raw materials, telephone and utilities, legal and accounting services, etc., are expenses incurred in the production of goods and services at customer companies. For the most part, however, industrial laundering does not appear to represent a substantial portion of overall operating costs, relative to other costs. The IRS data cost category in which costs for industrial laundering is captured is the "other deductions" category.[4] According to IRS data, "other deductions" constitute between 3 and 23 percent of total annual expenses at 14 of the major customer industries for industrial laundries (see Table 8-1). Given that "other deductions" includes a number of other miscellaneous costs aside from those for industrial laundering, the actual percentage of total annual costs devoted to textile cleaning and rental is estimated to be quite small. The fact that, as discussed in Section Three, customers do not appear to regard the selection of an industrial launderer as a "high-risk" decision or to shop around before selecting a supplier[5] seems to support this conclusion because it suggests that containment of industrial laundering costs is not a major concern to the typical customer.

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[3] The industrial laundries customers discussed in Section Three were grouped according to SIC code. The industry groupings used by the Internal Revenue Service in the Corporation Source Book of Statistics of Income are based on the Enterprise Standard Industrial Classification (ESIC), which corresponds closely with, but does not match, the SIC. An ESIC group corresponding to SIC 80 (Health Services) could not be found, so only 14 industry groups are mentioned in this section.

[4] "Other deductions" are expenses other than the cost of goods, compensation of officers, salaries and wages, repairs, bad debts, rent paid on business property, taxes paid, interest paid, contributions or gifts, amortization, depreciation, depletion, advertising, pension and profit sharing, employee benefit programs, and the net loss associated with noncapital assets.

[5] Levite, Caryn Adair, 1996. "Getting there first is half the sale." *Industrial Launderer*. August, p. 30.

Table 8-1

Average Financial Statistics for Active Corportions in 14 Industrial Laundries Customer Industries (1993 $)*

(in thousands)

ESIC Group**	Industry Title	Average Assets	Receipts: Avg. Total Receipts	Receipts: Avg. Business Receipts	Deductions: Avg. Total Deductions	Deductions: Avg. "Other" Deductions***	Deductions: Pct. "Other" Deductions***	Average Receipts minus Deductions
39	Automotive Dealers & Service Stations	$1,350	$5,687	$5,593	$5,631	$172	3.06%	$56
7500	Auto Repair & Services	$540	$798	$760	$783	$101	12.86%	$15
42	Eating and Drinking Places	$472	$869	$836	$850	$128	15.10%	$19
38	Food Stores	$1,439	$5,057	$4,971	$4,983	$240	4.82%	$74
08	Special Trade Contractors	$314	$976	$967	$955	$77	8.05%	$21
5089	Wholesale Trade: Other Durable Goods	$1,331	$3,039	$2,994	$2,990	$200	6.69%	$50
24	Machinery, except Electrical	$9,769	$11,513	$10,574	$11,174	$1,197	10.71%	$338
16	Printing and Publishing	$3,478	$3,346	$3,181	$3,128	$457	14.59%	$218
54	Business Services	$703	$985	$930	$949	$173	18.19%	$36
09	Food and Kindred Products	$25,822	$26,926	$25,723	$25,765	$2,476	9.61%	$1,161
23	Fabricated Metal Products	$3,101	$4,541	$4,436	$4,309	$304	7.06%	$232
8200	Educational Services	$321	$643	$625	$625	$145	23.15%	$18
5190	Wholesale Trade: Misc. Nondurable Goods	$1,065	$2,963	$2,922	$2,910	$179	6.16%	$53
43	Miscellaneous Retail Stores	$625	$1,481	$1,452	$1,454	$114	7.86%	$27

* Numbers from 1994 tax year, deflated to 1993 dollars using the Producer Price Index for Finished Goods.

** The Internal Revenue Services groups industries according to their primary Enterprise Standard Industrial Classification (ESIC) code. ESIC codes correspond closely with, but do not match, SIC codes.

*** Does not include cost of goods, compensation of officers, salaries, repairs, bad debts, rent, taxes, interest, contributions or gifts, amortization, depreciation, depletion, advertising, pension, employee benefits, and net loss (noncapital assets). Expenses for industrial laundering services would be in this "other" category.

Source: U.S. Internal Revenue Service, 1994. "Balance sheet, income statement, tax and selected items by major and minor industries, size of total assets." Tax Year 1994 Source Book, Statistics of Income: Active Corporation Income Tax Returns, July 1994-June 1995. Washington, DC: U. S. Internal Revenue Sevice.

Consistent with this, EPA does not expect the cost of the IL Standards to substantially affect industrial laundries' customer industries. Relative to other operating costs, the cost of industrial laundering services is quite small. As such, an increase in costs is not likely to have a major impact on the bottom line at customer industries. Furthermore, as will be discussed below, few viable substitutes to industrial laundering currently exist.

8.3.2.1 Increases in Production Costs

The total cost of the IL Standards is estimated to be about $85 million per year. If industrial laundries are able to pass 100 percent of the costs of compliance on to their customer industries, EPA conservatively estimates that costs at these industries would increase, on average, by less than 0.02 percent.[6] Since industrial laundries are only estimated to be able to pass 32 percent of the costs of the regulation through to customers (see Appendix A), moreover, the actual percent increase in costs at customer industries due to the IL Standards will likely be much smaller than 0.02 percent.

8.3.2.2 Potentials for Substitution

The IL Standards also are unlikely to cause customer industries to switch from industrially laundered textiles to substitute products. As discussed in Section 3.2.2.2, few real substitutes to the products and

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[6] The IRS estimates "total deductions" at the 14 major customer industry groupings discussed above to be $3.5 trillion. This figure includes operating costs, interest, and taxes paid. If only 10 percent of the firms in these industry groupings use industrial laundries, annual expenses at the firms potentially affected by the proposed IL Standards would total approximately $353 billion. Assuming that these customers bear all the costs of the rule ($85 million), the IL Standards would increase total expenses at customer industries by 0.02 percent.

If the costs of the rule are compared only to "other deductions" at 10 percent of the firms in the 14 major customer industries ($31.5 billion), the $85 million costs of the rule would raise expenses for other deductions by 0.27 percent. "Other deductions," as discussed above, are annual expenses, such as industrial laundering costs, that do not fit in any of the major expense categories. These estimates are conservative because the 14 major customer industries included in this calculation represent only part of the industrial laundries customer base. Also, only firms that are incorporated are included in the aggregate costs/expenses estimated by the IRS; sole-proprietorships and S-corporations, which are taxed at the level of the individual instead of the corporation, are not reflected in these numbers.

services provided by industrial laundries currently exist. Reusable textiles are typically more durable than disposables, so customers for industrially laundered items such as industrial uniforms, mats, and mops, which are subject to heavy use, do not have many disposable alternatives. With respect to wipers and shop towels, moreover, the quality of the single-use shop towels now on the market might not be high enough for use by the printing industry because printers require towels that are both durable and generate little lint.[7] Customers in the automotive industry might place more emphasis on price than quality in the selection of towels, but in industrial settings it has been found to be more economical to use cloth towels than paper wipers for all but a dirty task that would require only one paper wiper.[8] Furthermore, the possibility that a disposable wiper might be considered hazardous waste under RCRA could further deter the substitution of disposables for industrial laundry services.

Another possible substitute for industrial laundry services is onsite laundries, which are excluded from coverage by the IL Standard. However, a number of major disincentives would exist. Establishing an onsite laundry would involve capital investment, and given the estimated average postcompliance price increase in industrial laundry services of $0.003 per pound of laundry and the overall impact that these price increases are expected to have on industrial laundries customers' costs, it is likely that the "payback" period for an onsite laundry might be too long to interest most customers. Furthermore, an increase in pollutant loads at a facility that installs an onsite laundry may necessitate additional changes in the facility's NPDES permit if it is a direct discharger or its pretreatment permit issued by the local POTW if it is an indirect discharger. A POTW might even initiate local limits (where none were previously required to be met) or might impose a surcharge.

Other possible substitutes for industrial laundry services would be for customers to drop industrial laundry services and, for example, require employees to purchase and launder their own clothing, or to reduce the frequency of pickup and laundering of certain items. Customers who use uniform rentals and related services for image reasons rather than strictly for cleanliness might be the likeliest to choose the former route if faced by higher prices, since image reasons for using industrial laundering services might not be as

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[7] 1997. "Wiper market watch: The view from EPA." *Industrial Launderer*. February, p. 61-63.

[8] Mullen, Jocelyn, and Carl Lehrburger, 1991. *A Solid Waste and Laundering Assessment of Selected Reusable and Disposable Products*. Washington, DC: Textile Rental Services Association of America and IIL.

compelling and might more likely to be targeted for cost-cutting measures than a need to remove stains that cannot be easily cleaned. Items such as mats might be targeted for reduction in frequency of pickup and laundering. Even this substitution is not likely to result in much of a move away from industrial laundries services as is reflected in EPA's results from the market model, presented in Appendix A, which indicate that production in the industrial laundries industry might be reduced about 0.3 percent. These reductions are associated with the lower demand for laundry services at the higher, postcompliance price and would represent the move by some customers towards some of the substitutes discussed above. This small percentage reduction in industrial laundries production might be unobservable, however, in the overall real growth of the industry, which averaged 4.2 percent per year in 1991 to 1993, according to data from the Section 308 Survey (see Section Three).

8.4 IMPACTS ON OTHER ESTABLISHMENTS THAT MIGHT LAUNDER INDUSTRIAL TEXTILE ITEMS

It is possible that the IL Standards, in theory, could have an impact on hotels, hospitals, prisons, and other establishments (e.g., manufacturing facilities) that could potentially launder industrial textile items from offsite sources. The IL Standards are written such that any wastewater generated from the laundering of industrial textile items from offsite sources by such establishments might be required to be treated before discharge. EPA believes that any impacts to such establishments from the IL Standards would be minimal.

EPA investigated a number of such establishments, primarily hotels, hospitals, prisons and other establishments such as manufacturing facilities, as a part of its HHPs Screener Survey discussed in Sections Two and Three. The results of this screener survey indicated that few such establishments in EPA's screener survey accept laundry of any sort from offsite, and among those that do, most appear to launder linens or health care items only.[9] EPA identified only one facility that accepts any industrial laundry from offsite sources. This facility is a manufacturing facility whose laundry wastewater makes up only 0.1 percent of its total flow. The facility is covered under another effluent guideline and has a CP system installed.

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[9]Anne Jones, ERG. 1997. "Analysis of hospitals, hotels, and prisons (HHPs) database." Memorandum to the Rulemaking Record, February 21.

This survey did not comprise a statistically representative sample of these types of facilities, so EPA cannot be certain the practice of laundering industrial items from offsite sources by these types of facilities is as rare as it seems. EPA estimates, however, that impacts on these types of facilities from the IL Standards would be no more than and most likely less than impacts on the industrial laundry facilities surveyed in the Section 308 Survey, for a number of reasons.

First, flow from these facilities, even if they launder industrial textile items from offsite sources, might meet the requirements of the IL Standards without any additional pollution control equipment. For example, the amount of industrial laundry proportionate to, say, linens might be so small the facility could meet the standards without installing pollution control, the facility might already be subject to an effluent guideline that also controls the pollutants of concern for industrial laundry, or the entire laundry operation might meet the definition of the exclusion.

Second, even if pollution control equipment were required, impacts are likely to be less than those on industrial laundry facilities surveyed in the Section 308 Survey because industrial laundering is not their major source of revenues—that is, they are primarily hotels, hospitals, prisons, manufacturing facilities, or others. In comparison, for many facilities surveyed in the Section 308 Survey, industrial laundry revenues are the primary or sole source of revenues. Facilities that only secondarily provide industrial laundry services would most likely have a larger revenue base than many of the Section 308 Survey facilities that launder a similar amount of industrial laundry, reducing the potential for impacts.

Third, if industrial laundry flow is small, wastewater hauling is likely to be a less expensive alternative than installing and operating pollution control equipment, contributing further to a lessening of potential impacts.

Finally, these establishments might have the option to drop laundering of industrial textile items, particularly if revenues from this operation are only a small fraction of overall revenues, which could also lessen impacts.

8.5 IMPACTS ON INFLATION

Under a worst-case scenario, which is that all costs are passed through to the ultimate consumer (including costs passed through by customers of industrial laundries), the entire $85 million per year cost of the IL Standards would fall directly on consumers. This cost as a portion of GDP is, however, minuscule: 0.001 percent of 1993 GDP.[10] Therefore, even under an assumption of a 100 percent cost passthrough to ultimate consumers, the IL Standards are highly unlikely to have any noticeable effect on inflation.

8.6 DISTRIBUTIONAL IMPACTS AND ENVIRONMENTAL JUSTICE

Because any potential price increases in the services offered by the industrial laundries industry affects a wide segment of the manufacturing, service, and trade industries (see Section Three), the impacts on ultimate consumers will be felt primarily to the extent that these potential price increases affect inflation. The groups most affected by the distributional impacts of the IL Standards therefore would be those most affected by general inflation: the elderly and others on fixed income and those in the lowest socioeconomic strata, including children. As noted above, however, the effect on inflation will be negligible. Thus the impacts to these more vulnerable groups would also be negligible.

The benefits of the IL Standards, discussed more fully in Section Ten, are also expected to be widely dispersed, and will include recreational anglers, POTWs, and thus the general public, and persons consuming fish from the reaches of surface water affected by industrial laundries effluent. Since the persons most likely to benefit from lower levels of contaminants in fish tend to be subsistence anglers, not recreational anglers, these benefits might accrue to persons in lower socioeconomic groups and/or native Americans. Also, since children of subsistence anglers are likely to be the most vulnerable of all these groups to any pollutants taken up by fish, this is another group most likely to accrue health benefits.

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[10]U.S. Government Printing Office, 1997. *Economic Report of the President, February 1997.* Washington, DC: U.S. Government Printing Office.

Thus many of those who might bear the costs of the regulation (however small), including children and those in lower socioeconomic groups, might also be those who gain the most benefit from the IL Standards.

SECTION NINE

INITIAL REGULATORY FLEXIBILITY ANALYSIS

9.1 INTRODUCTION

This section examines the projected effects of the costs from incremental pollution control on small entities as required by the Regulatory Flexibility Act (RFA, 5 U.S.C. 601 et seq., Public Law 96-354) as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA). The RFA acknowledges that small entities have limited resources and makes the regulating federal agency responsible for avoiding burdening such entities unnecessarily. Pursuant to the RFA, EPA has prepared an initial regulatory flexibility analysis (IRFA).[1] Section 9.2 reviews the steps suggested in Agency guidance materials to determine whether a regulatory flexibility analysis is required and how to identify significant impacts on small businesses. Section 9.3 responds to the regulatory flexibility analysis components required for a proposed rule by Section 603 of the RFA. Section 9.4 is a detailed description of the small business economic analysis performed for the proposed regulation.

9.2 INITIAL ASSESSMENT

The following passage lists the initial assessment steps suggested in current EPA guidance.[2] The steps are posed as a series of questions and answers:

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[1] The preparation of an IRFA for a proposed rule does not legally foreclose certifying no significant impact for the final rule; see U.S. EPA, 1997. *Interim Guidance for Implementing the Small Business Regulatory Enforcement Fairness Act and Related Provisions of the Regulatory Flexibility Act.* February 5.

[2] U.S. EPA, 1992. *EPA Guidelines for Implementing the Regulatory Flexibility Act.* U.S. Environmental Protection Agency, Office of Policy, Planning, and Evaluation, April; and U.S. EPA, 1997. *Op. cit.*

- Is the Rule Subject to Notice-and-Comment Rulemaking Requirements?

  The Effluent Limitations Guidelines and Standards for the Industrial Laundry Industry Point Source Category is subject to notice-and-comment rulemaking requirements.

- Profile of Affected Entities

  EPA prepared a profile of the regulated universe of entities; see Section Three and Section 9.3.2.

- Will the Rule Affect Small Entities?

  Yes.

- Will the Rule Have an Adverse Economic Impact on Small Entities?

  EPA has determined that some small entities might incur costs for incremental pollution control as a result of the rule, if promulgated as proposed. EPA examines the impacts of these additional costs in Section 9.4.

9.3 REGULATORY FLEXIBILITY ANALYSIS COMPONENTS

Section 603 of the RFA requires that an IRFA must contain the following:

- An explanation of why the rule may be needed.
- A short explanation of the objectives and legal basis for the proposed rule.
- A description of, and where feasible, an estimate of the number of small business entities to which the proposed rule will apply.
- A description of the proposed reporting, recordkeeping, and other compliance requirements (including an estimate of the types of small entities which will be subject to the requirement and the type of professional skills necessary for the preparation of the report or record).
- An identification, to the extent practicable, of all relevant federal rules which may duplicate, overlap, or conflict with the proposed rule.
- A description of "any significant regulatory alternatives" to the proposed rule which accomplish the statement objectives of the applicable statutes and which minimize any significant economic impact of the rule on small entities.

9.3.1 Need for and Objectives of the Rule

The rule is being proposed under the authority of Sections 301, 304, 306, 307, 308, and 501 of the Clean Water Act, 33 U.S.C. Sections 1311, 1314, 1316, 1317, 1318, and 1361. Under these sections, EPA sets standards for the control of discharge of pollutants for the Industrial Laundries Industry Point Source Category. The regulations also are being proposed pursuant to a Consent Decree entered in NRDC et al. v. Reilly (D.D.C. No. 89-2980, January 31, 1992), and are consistent with EPA's latest Effluent Guidelines Plan under Section 304(m) of the CWA (see 61 FR 52582, October 7, 1996).

The objective of the CWA is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." To assist in achieving this objective, EPA issues effluent limitations guidelines, pretreatment standards, and new source performance standards for industrial dischargers. Sections 304(g) and 307(b) authorize EPA to issue PSES and PSNS for all pollutants.

9.3.2 Estimated Number of Small Business Entities to Which the Regulation Will Apply

The section begins with a discussion of the definition of "small business" for the purpose of responding to the requirements of the regulatory flexibility analysis, then summarizes the data available for the estimated number of small business entities and the methodology used in calculating that estimate.

9.3.2.1 Definition

The RFA and SBREFA both define "small business" as having the same meaning as the term "small business concern" under Section 3 of the Small Business Act (unless an alternative definition has been approved). The latter defines a small business at the business entity or company level, not the facility level. The analysis, then, needs to determine whether an industrial laundry facility is owned by a small business entity, not whether the facility itself may be considered "small."

The definition of "small" generally is defined by standards for each SIC code as set by the Small Business Administration (SBA). As discussed in the industry profile (see Section Three), the industrial laundries industry is covered by a number of SIC codes. The predominant SIC codes also are discussed in Section Three. In SIC code 7218, SBA defines "small" as firms with revenues of less than $10 million per year; for SIC 7211 and 7213, "small" is defined as less than $10.5 million per year. Less than $10.5 million per year in revenues is the definition EPA is using for this analysis.

9.3.2.2 Estimated Number of Small Business Entities

EPA sent the Section 308 Survey questionnaire to a sample of industrial laundry facilities. The sampling frame for the questionnaire was stratified on the basis of facility characteristics, including facility revenues (see Section Two and EPA's *Statistical Support Document for Proposed Pretreatment Standards for Industrial Laundries*). Therefore, it is possible to estimate statistically the number of facilities, but the same statistical approach cannot be used to estimate the number of companies or business entities, other than single-facility firms. For single-facility firms, the number of business entities is the statistically weighted total number of single-facility firms. For multifacility firms, EPA used a different approach, which was described in detail in Section Six. Using both sets of estimates, EPA calculates that there are 837 total small industrial laundry firms out of 903 firms (92.7 percent). These 837 firms are estimated to own 900 facilities.

When baseline failures/closures are removed from the analysis (see Section 5.1.2 of this EA for a discussion of how EPA establishes the baseline against which to measure impacts), EPA estimates that there are 675 single-facility firms, of which 659 (97.6 percent) are defined as small (see EPA's rationale on removing baseline closure and failures from the analyses in Sections Five and Six of this EA). EPA also estimates that there are 70 multifacility firms, only 25 of which (35.7 percent) are defined as small. Thus, EPA estimates that out of the 745 total in-scope industrial laundry firms in the postcompliance analysis, 684 (91.8 percent) are defined as small.

Not all of these firms will be affected by the regulations, however. EPA has defined a group of facilities it proposes to exclude from coverage by the rule. This group includes all industrial laundry facilities that process fewer than 1 million water-washed pounds of laundry per year and fewer than 255,000 pounds of shop towels and printer towels/rags per year. EPA proposes to exclude this group because these facilities are associated with very small pollutant loads, yet, financially, are very vulnerable to potential impacts from the IL Standards. (Other aspects of EPA's reasoning are discussed in more detail in the preamble to this rulemaking.) Generally, these 141 facilities have revenues of less than $1 million, and most (128, or 90 percent) are single-facility firms. Appendix E presents the impacts that EPA avoids by excluding these firms and facilities. EPA measures impacts in this section against all small firms in the postcompliance analysis (684 firms).

Small firms were profiled in detail in Section Three, which presents the number of firms and the financial profile of all firms broken down into detailed revenue categories. Table 9-1 summarizes these financial characteristics, showing the differences between those classified as small (including those in the excluded group) and those classified as large and provides some additional comparative measures of financial health: a pretax return on assets ratio and a pretax return on equity ratio for both small and large firms.[3] As the table shows, the typical small firm generally has smaller earnings, working capital, total assets and liabilities and owner equity than the typical large firm, but the small size does not necessarily mean less healthy financially. Both small and large firms, on average, show strong returns on assets and equity, pretax. Furthermore, small firms might even have slightly better ratios than the larger firms, although the differences seen might not be statistically significant. (Additional detailed information on comparative financial health between small and large firms was presented in Section Three.)

9.3.3 Description of the Proposed Reporting, Recordkeeping, and Other Compliance Requirements

Under current law, before this rule, as well as after implementation of this rule, all affected firms are subject to monitoring and permitting requirements.

9.3.4 Identification of Relevant Federal Rules Which May Duplicate, Overlap, or Conflict With the Proposed Rule

EPA addressed concerns about duplication by excluding onsite laundries, since these facilities are the most likely to be covered by another effluent guidelines or standards or might be covered by future effluent

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[3] Pretax returns are based on earnings before interest and taxes. Pretax returns are used here for comparative purposes because many small firms do not pay corporate taxes.

Table 9-1

Number of Firms and Average Financial Measures, by Firm Size (1993 $)*

Revenue Group	Number of Firms*	Earnings Before Interest and Taxes	Working Capital	Total Assets	Total Liabilities	Owner Equity**	Ratio of Earnings to Owner Equity**	Ratio of Earnings to Total Assets
Less than $10.5 million	741	$270,411	$462,269	$2,949,856	$640,057	$2,310,300	0.2853	0.1341
$10.5 million or greater***	66	$8,825,605	$13,383,059	$64,444,134	$20,429,506	$44,014,645	0.2845	0.1064
All firms***	807	$951,001	$1,490,155	$7,841,900	$2,214,364	$5,634,265	0.2852	0.1319

* The 96 single-facility firms estimated to be baseline closures in Section 5 have been excluded from this analysis.
** Owner equity is being used as a proxy for retained earnings in Altman Z" analyses of firm-level impacts.
*** Two weighted firms that are statistical outliers were not included in the calculation of financial measures.

Source: Section 308 Survey.

guidelines. See EPA's discussion of the onsite laundries exclusion in the preamble to the proposed rulemaking.

9.3.5 Significant Regulatory Alternatives

EPA took steps to minimize the regulatory burden associated with the rulemaking. First, EPA excluded certain small industrial laundries facilities, as described above, specifically to minimize impacts on the smallest and most financially vulnerable of industrial laundry firms. Second, EPA considered multiple regulatory alternatives when making its determination of economic achievability. The Agency investigated four options and numerous definitions of an exclusion (see Appendix E) to help in selecting an economically achievable regulatory approach. Third, EPA selected one of the two least expensive options for proposal to further minimize impacts.

9.4 SMALL BUSINESS ANALYSIS

As a first step in this analysis, EPA undertook a revenue test, as prescribed by EPA's SBREFA Guidance (see Table 9-2). As table shows, EPA estimates that the annual cost of the CP option would exceed 3 percent of revenues at only 69 facilities. EPA's Guidance allows EPA to identify quickly rules that could be certified as having no significant impact on a substantial number of small entities. At this time, however, EPA has elected to perform an IFRA,[4] which this section (Section Nine) constitutes. The following presents the impacts associated with EPA's preferred and alternative options.[5]

For the purposes of this rulemaking for this industry, in the context of developing standards under the CWA, EPA defines impact on a small industrial laundries firm as: 1) a closure (for a single-facility firm), specified as a change in cash flow from positive to negative as a result of compliance with the proposed

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[4] The preparation of an IFRA for a proposed rule does not legally foreclose certifying no significant impact for the final rule; see U.S. EPA, 1997. *Op. cit.*

[5] EPA has chosen a combination of cash flow and financial ratio (Altman Z"-score) analyses to estimate the number of significantly affected small firms.

Table 9-2

SBREFA Revenue Test Analysis

Impact Category Costs/Revenues	OC		CP		COMBO		DAF	
	No. of Small Firms	% of All Small Firms	No. of Small Firms	% of All Small Firms	No. of Small Firms	% of All Small Firms	No. of Small Firms	% of All Small Firms
> 1 Percent	88	12.81%	383	55.95%	384	56.19%	473	69.20%
> 3 Percent	2	0.24%	69	10.11%	69	10.11%	153	22.38%
> 5 Percent	2	0.24%	3	0.44%	2	0.24%	68	9.91%
>10 Percent	2	0.24%	2	0.24%	2	0.24%	2	0.24%

Note: The total number of small firms (revenues less than $10.5 million) that do not fail or close in the baseline is 684 firms.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

regulation, or 2) a potential bankruptcy (for any small firm), defined as a change in an Altman Z"-score from one indicating a healthy or indeterminate financial condition to one indicating poor financial health. The Altman Z"-score is a composite of a number of common financial ratios (see Section Six). EPA combines these two types of impacts (closures and failures), using two very different ways of measuring impacts, to create an overall measurement that is likely to reasonably represent the effect of the rule on small entities.

Table 9-3 presents the results of the firm failure analysis (as discussed in Section Six) combined with the facility closures (as discussed in Section Five) among single-facility firms that do not also fail (to avoid double-counting impacts). EPA combines these impacts to evaluate impacts in this section of the EA because if a single-facility firm's facility closes, the firm will fail. As Table 9-3 shows, the preferred option is associated with 98 postcompliance failures/closures among small firms and no failures or closures among large firms. The number of firms closing or failing is 14.3 percent of all small firms or 13.2 percent of all firms in the postcompliance analysis. In Appendix E, EPA investigates what the impact would have been had the Agency not defined an exclusion. As can be seen in Appendix E, an additional 27 failures/closures among small firms are avoided by using the regulatory exclusion. Had these facilities not been excluded, the total number of small firms failing/closing would have been 125, or 18 percent of all small firms not failing or closing in the baseline.

Although small entities do bear most to all of the identified impacts of the regulation, they also constitute more than 90 percent of the affected universe. Furthermore, the numbers of small firms closing or failing with the exclusion in place is 14.3 percent of all small firms, whereas the number of total firms failing or closing out of all firms is 13.2 percent. The difference between these percentages is so small that EPA contends that the proposed rulemaking has no disproportionate effects on small firms.

Table 9-3

Closures Plus Failures: Small vs. Large Firms

Firms	OC	CP	COMBO	DAF
Small Firms*	25	98	98	100
Percentage of all small firms	3.6%	14.3%	14.3%	14.6%
Large Firms	0	0	0	0
Percentage of all large firms	0.0%	0.0%	0.0%	0.0%

* Percentages are calculated over all small firms (684), excluded and nonexcluded.

Source: Tables 5-4 and 6-4 in Sections Five and Six of this EA.

SECTION TEN

COST AND BENEFITS OF THE IL STANDARDS

10.1 INTRODUCTION

10.1.1 Requirements of Executive Order 12866 and the Unfunded Mandates Reform Act (UMRA)

This section has been prepared to comply with Executive Order 12866, which requires federal agencies to assess the costs and benefits of each significant rule they propose or promulgate. The principal requirements of the Executive Order are that the Agency perform an analysis comparing the benefits of the regulation to the costs that the regulation imposes, that the Agency analyze alternative approaches to the rule, and that the need for the rule be identified. Wherever possible, the costs and benefits of the rule are to be expressed in monetary terms. To address the analytical requirements, as specified by the Executive Order, this section discusses the social costs of the rule in Section 10.2, pollutant reductions in Section 10.3, the benefits of the rule in Section 10.4, and the comparison of costs and benefits in Section 10.5. The industry has been profiled in Section Three of this EA, the technology options and regulatory alternatives were presented in Section Four, and impacts of the rule and its alternatives were discussed in Sections Five through Nine. Section 10.1.2, below, presents the need for the regulation.

This section also has been prepared to comply with UMRA. Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), P.L. 104-4, establishes requirements for federal agencies to assess the effects of their regulatory actions on state, local and tribal governments and the private sector. Under section 202 of the UMRA, EPA generally must prepare a written statement, including a cost-benefits analysis, for proposed and final rules with "federal mandates" that may result in expenditures to state, local and tribal governments, in the aggregate, or the private sectors, of $100 million or more in any one year.

Before promulgating an EPA rule for which a written statement is needed, section 205 of UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective, or least burdensome alternative that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows EPA to adopt an alternative other than the least costly, most cost-effective or least burdensome alternative if the Administrator publishes with the final rule an explanation why that alternative was not adopted.

Before EPA establishes any regulatory requirements that might significantly or uniquely affect small governments, including tribal governments, it must have developed under section 203 of the UMRA a small government agency plan. The plan must provide for notifying potentially affected small governments, enabling officials of affected small governments to have meaningful and timely input in the development of EPA regulatory proposals with significant federal intergovernmental mandates, and informing, educating, and advising small governments on compliance with the regulatory requirements.

Although some states and local governments will incur costs to implement the IL Standards, these costs to governments might not exceed the thresholds established by UMRA and, in general, the IL Standards will make it easier for POTWs to establish limits on discharge to POTWs. Although EPA does not believe the rule imposes significant or unique effects on small governments, under sections 203 and 205 of the UMRA, EPA has consulted with state and local governments.

EPA has determined, however, that the proposed rule would contain a federal mandate that might result in expenditures of $100 million or more for the private sector in any one year. Accordingly, EPA has prepared the written statement required by section 202 of the UMRA. This and previous sections of the EA constitute this statement: Sections Five and Six of the EA identify impacts to firms and facilities covered by the rule, and Sections Seven and Eight identify output, employment, and other secondary impacts of the rule.

EPA does not believe that there will be any disproportionate budgetary effects of the proposed rule on any particular areas of the country, particular types of communities, or particular industry segments. EPA's basis for this finding is the analysis of economic impacts, which is presented in the previous sections of this EA.

Furthermore, EPA has selected the "least costly, most cost-effective, and least burdensome alternative," for both PSES and PSNS that was consistent with the CWA. This satisfies section 203 of the UMRA. As part of the proposed rulemaking, EPA has identified and considered a reasonable number of regulatory alternatives, as described in Section Four of this EA. EPA's selection from among various options is consistent with the requirements of the UMRA in terms of costs, cost-effectiveness, and burden.

10.1.2 Need for the Regulation

Executive Order 12866 requires that the Agency identify the need for the regulation being proposed. The discharge of pollutants into effluent and hence into surface water pose a threat to human health and the environment. Risks from these discharges include the potential for cancer and other adverse noncancer health effects and degradation of the environment. These discharges also might cause inhibition problems at POTWs. This section discusses: (1) the reasons the marketplace does not provide for adequate pollution control absent appropriate incentives or standards; (2) the environmental factors that indicate the need for additional pollution controls for this source category; and (3) the legal requirements that dictate the necessity for and timing of this regulation.

The need for pretreatment standards for this source category arises from the failure of the marketplace to provide the optimal level of pollution control desired by society. Correction of such a market failure can require federal regulation. OMB defines market failure as the presence of externalities, natural monopolies, and inadequate information.[1] This section addresses the category of externalities, which is the category of market failure most relevant to the general case of environmental pollution.

The concept of externalities partially explains the discrepancy between the supply of pollution control provided by owners and operators of pollution sources and the level of environmental quality desired by the general population. The case of environmental pollution can be classified as a negative externality because it is an unintended byproduct of production that creates undesirable effects on human health and the environment.

In making production decisions, owners and operators will consider only those costs and benefits that accrue to them personally (i.e., internalized costs and benefits). However, the cost of environmental pollution

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[1] OMB, undated. "Memorandum to the regulatory working group on economic analysis of federal regulation under Executive Order 12866." Sally Katzen.

is not borne solely by the creators of the pollution because all individuals in the polluted area (which can be quite large since pollution does not usually stay in one place) must share the social cost of exposure to the pollution. Therefore, although owners and operators might be the creators of pollution, they do not necessarily bear the full costs of the pollution. Government regulation is an attempt to internalize the costs of pollution.

If the people affected by a particular pollution source could negotiate with the party responsible for that source, the parties could negotiate among themselves to reach an economically efficient solution. The solution would be efficient because it would involve only those individuals who are affected by the pollution. In effect, the solution would involve the trading of pollution and compensation among the owner or operator and the people affected by that pollution.

Individual negotiation often does not occur in an unregulated market, however, because of high transaction costs, even if trade among the affected parties would be beneficial to all parties involved. For the majority of environmental pollution cases, the costs of identifying all the affected individuals and negotiating an agreement among those individuals is prohibitively high. Another problem preventing negotiations from taking place is that our current market system does not clearly define liability for the effects of pollution.

In the case of environmental quality, an additional problem is the public nature of this "good." Environmental quality is a public good because it is predominantly nonexcludable and nonrival. Individuals who willingly pay for reduced pollution cannot exclude others who have not paid from also enjoying the benefits of a less polluted environment. Because many environmental amenities are nonexcludable, individuals utilize but do not assume ownership of these goods and therefore will not invest adequate resources in their protection. The result is that in the absence of government intervention, the free market will not provide public goods, such as a clean environment, at the optimal quantity and quality desired by the general public.

In the case of the industrial laundries industry, the result of the market's failure to promote water pollution control is that pollution of the nation's surface waters and ground waters is not controlled to the optimal level. This industry releases significant amounts of pollutants to surface waters and wastewater treatment sludges through wastewater treatment plants. Despite state and local regulatory programs, many areas are still adversely affected by pollutant discharges by this industry. Section 10.3 discusses in detail the impacts of the regulation on reducing pollutants entering surface water and sewage sludges.

Both UMRA and Executive Order 12866 require the statutory authority for the rule to be cited. The regulation is proposed under the authorities of sections 301, 304, 306, 307, and 501 of the Clean Water Act (the Federal Water Pollution Control Act Amendment of 1972, 33 U.S.C. 1251 et seq., as amended by the Clean Water Act of 1987, Pub. L. 100-4, also referred to as the CWA or the Act).

10.2 SOCIAL COSTS OF THE RULE

In the Development Document (as discussed in earlier sections of this EA), EPA developed annual costs of the rule based on the costs of labor, equipment, material, and other resources needed for regulatory compliance. Although these costs are a major portion of the costs to society of the proposed regulation, they are not the only costs. The costs investigated earlier in this document reflect the costs from the perspective of the regulated community, not from the perspective of the whole society. In this section, EPA estimates the social cost of the regulation, including the costs to society for the resources needed to comply with the proposed regulation, and other significant cost categories, described briefly below.

10.2.1 Cost Categories

Social costs of a regulation comprise costs that go beyond just the facilities' costs of purchasing, installing, and operating pollution control equipment (compliance costs). Some of these additional costs are monetary, but many are nonmonetary. Additional monetary costs include the federal and state subsidies in the form of a tax shield, costs of administering a regulation (permitting costs), and the costs of administering unemployment benefits (unemployment benefits themselves are transfer payments, not a cost), including the cost of relocating displaced workers. Additional nonmonetary costs include the inconvenience, discomfort, and time loss associated with unemployment, possible losses in consumer and producer surpluses, and possible slowdown in the rate of innovation if the industry bears large compliance costs. This section discusses in more detail the types of costs that may be components of a social cost estimate. Section 10.2.3 presents the estimates for the cost categories to which EPA could assign monetary values.

Compliance Costs

The largest component of social cost is the cost to industry of complying with the regulation. These costs have been discussed in Section Four, but are incomplete for the purposes of this section. The costs presented in Section Four are the posttax costs (the costs to industry after compliance costs have been expensed or depreciated for tax purposes and income taxes have been paid on earnings). These posttax costs reflect the tax shield on compliance costs. The tax shield is the cost to the state and federal governments of subsidizing, in effect, the cost of the regulation. Tax shields are also a cost to society and must be included in the estimate of social costs. Furthermore, since the costs to society are being calculated in this section, EPA uses the social discount rate of 7 percent, as recommended by OMB,[2] rather than the facility's private discount rate used in the economic impacts analysis (see Section Four) (although the average private rate is almost identical to the social discount rate in this instance).

Note that the pretax compliance costs can be viewed as an estimate of the net output loss to the economy, which was presented in Section Seven ($91.1 million annually for CP), plus consumer and producer surplus losses. EPA does not use the net output loss, because the Agency would then need to compute consumer and producer surplus losses. Because the pretax costs include no cost passthrough assumptions, no consumer surplus is lost. Additionally, the pretax cost will incorporate the loss in producers' surplus. The pretax costs of compliance thus serve as a proxy for the net output loss plus losses in consumer and producer surplus.

These costs have not been adjusted either by baseline closures/failures of facilities or firms. The analysis in Section Six shows that all failing firms are viable facilities (i.e., do not close) postcompliance. As discussed in Section Six, EPA expects them to be sold and operated, thus they would incur compliance costs. Additionally, no nonindependent facilities (those owned by multifacility firms) are assumed to close in the baseline but are evaluated at the firm level. Since the firms can afford to operate the facilities postcompliance, EPA assumes all nonindependent facilities will install pollution control equipment. In regard to the few single-facility firms that might not install pollution control equipment due to closure in the baseline, EPA assumes that the industrial laundries market is in equilibrium in the baseline, thus the quantity of production

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[2] OMB, undated. *Op. cit.*

demanded will not change regardless of facilities exiting the market. EPA therefore assumes that this quantity of production will be taken over by other sources. It is likely, however, that including the compliance costs for single-facility firm baseline closures will overstate actual compliance costs, since costs for designing-in equipment at new facilities are generally less than costs to existing facilities for retrofitting equipment, and costs for additional treatment capacity at an existing facility that expands production (assuming no capacity constraints) can be less than costs for installing a complete system at an existing facility that is estimated to close in the baseline. By including costs for baseline closures, EPA is overstating compliance costs and therefore is presenting a worst-case scenario for social costs. The actual costs would lie somewhere between costs calculated assuming that there are no costs to single-facility firms that are baseline closures and the costs estimated here ($121.7 million vs. $123.4 million under the CP option).

Costs also are not adjusted downward for postcompliance closures, even though these facilities are assumed not to install or operate this equipment. The compliance costs to these facilities total $3.8 million annually. EPA considers these costs a reasonable upper estimate of the costs to the firms of closing their facilities.[3] The firm will choose, to the extent possible, the less expensive of the two choices: install and operate pollution control or close the facility.

Administrative Costs

Implementating the proposed IL Standards will require that permitting authorities incur costs for writing, monitoring, and enforcing permits under the regulation. These costs of administering the regulation will add to the resource cost of regulatory compliance and are part of the total social cost of the regulation. From analysis of the Section 308 Survey database, EPA estimates that all of the 1,606 facilities that are expected to be subject to regulation currently discharge to a POTW without a federally mandated permit.[4] EPA estimated the incremental administrative costs of administering the regulation for these facilities in the following five categories:

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[3] These liquidation costs include legal fees, broker fees, etc.

[4] Many facilities have permits from their local POTWs. These permits vary widely in form and function, but are generally not of the scope mandated by the federal pretreatment standard permit system.

- Permit application and issuance (developing and issuing permits, providing technical guidance, conducting public hearings, and conducting evidentiary hearings);
- Inspection (conducted for initial permit development or subsequent inspection);
- Monitoring (sampling and analyzing permittee's effluent, reviewing and recording permittee's compliance self-monitoring reports, receiving, processing, and acting on a permittee's noncompliance reports, and reviewing a permittee's compliance schedule report for a permittee in compliance and a permittee not in compliance);
- Repermitting; and
- Enforcement

Although other administrative costs (e.g., identifying facilities to be permitted, providing technical guidance to permittees in years other than the first year of the permit, and repermitting a facility in significant noncompliance) might be incurred infrequently by some POTWs, EPA believes the above five categories capture the bulk of the administration burden of the proposed regulation. Note, however, that some of the administrative costs might be offset by cost savings at POTWs that need to develop local limits, since it is less time consuming for POTWs to write permits when national limits have been set. These cost savings have not been estimated.

Worker Dislocation Costs

EPA also investigates costs associated with worker dislocations as an additional component of social costs. These costs comprise the value to workers of avoiding unemployment and the costs of administering unemployment (the unemployment benefits themselves, as discussed above are transfer payments, not costs). Some of these costs may, however, be double counted, given workers' dislocation costs are calculated for facilities that also are projected to incur compliance costs in the postcompliance scenario (see Section 10.2.3).

Nonmonetary Costs

Several other cost categories are not discussed in detail in the social cost estimate section, below. The first is loss of consumer and producer surpluses. As noted earlier, the use of the total pretax cost of compliance, rather than the net output loss as calculated in Section Seven, provides a reasonable upper limit estimate of the social cost of the regulation for pollution control including losses of consumer and producer surpluses. The cost estimate section also does not discuss the cost associated with a slowdown in the rate of innovation. Monetizing the loss associated with a slowdown in the rate of innovation is a very difficult task. This industry, however, does not have a high rate of innovation, as discussed in Section Three. Much of the technology currently in use is very old, and although there has been some interest recently in automation, there has not been a major trend towards innovative technology in this industry. Although, in theory, there might be some small impact on the rate of innovation to the extent that the industry might invest in newer technologies, such as automated laundry processing equipment, if they did not have to allocate resources to meeting the requirements of the proposed IL Standards, a noticeable effect is highly unlikely. First, compliance costs are not large relative to industry revenues, comprising only about 1% of those revenues on average. Second, as noted above and in Section Three, this industry shows a very low level of capital investment relative to many industries. Innovation is not a key factor in the competitiveness of facilities in this industry.

10.2.2 Estimate of Social Costs

10.2.2.1 Costs of Compliance

As Table 10-1 shows, the social (pretax) cost of compliance for the options under consideration range from $59.4 million to $159.9 million annually. The selected option, CP, has an annualized pretax cost of $123.4 million ($1993).

10.2.2.2 Administrative Costs

EPA's analysis of the administrative costs of the IL Standard is based on the estimated length of time and cost needed to perform each of the administrative functions listed previously in Section 10.2.2.2 and the frequency of administrative activities for the facilities subject to regulation. The information on length of time and cost for the administrative functions was originally compiled as part of the analysis of administrative costs for the proposed Metal Products and Machinery Industry (MP&M) Phase 1 regulation, conducted in

Table 10-1

Social Costs of Compliance
(Purchase, Installation, and Operation of Pollution Control Equipment)
(1993 Dollars)

Option	Total Capital Cost	Total O&M Cost	Total Pretax Annualized Costs
OC	$262,564,089	$31,637,263	$59,431,680
CP	$425,080,135	$78,386,103	$123,384,086
COMBO	$398,489,118	$89,086,664	$131,269,785
DAF	$329,375,032	$125,064,765	$159,931,631

Source: Development Document (see text for how pretax costs are calculated).

1995. The original sources of this data included: Information Collection Request analyses; a resource planning model used by EPA; an informal survey of six POTWs and three state permitting officials, and discussions with EPA Regional Office and headquarters permitting staff.[5] EPA believes the time and cost of administrative functions for implementing the IL Standards are not likely to differ materially from those for the MP&M regulation and hence the estimates developed for the MP&M regulation are used in this analysis. The original time estimates were developed as a range based on variation in the values obtained from the different sources. This analysis retains these ranges and presents results based on low, high, and average time estimates for each of the activities in the permitting process. To calculate a unit cost for each administrative event, EPA multiplied the time estimates by an average hourly labor cost of $42 ($1993).[6] The $42 cost includes an allowance for fringe benefits, payroll taxes, and other overhead and expense items that would be incurred by the permitting authority.

EPA used the unit cost estimates, the estimated frequencies of the administrative activities per facility, and the number of facilities subject to regulation to estimate the administrative costs of regulation over a 16-year period following rule promulgation. The annual costs, which vary by year because some events do not occur annually, were discounted at a rate of 7 percent and assumed to yield a total present value of administrative cost over the 16-year period. The total present value of cost was then annualized at the 7 percent discount rate to yield an annualized value of administrative cost for inclusion in the calculation of total social cost of the proposed IL Standards.

In performing this analysis, EPA made two assumptions that are specific to the IL Standards:

- First, EPA assumed that any facilities that are currently monitoring their wastewater will require less technical guidance from permitting authorities and thus impose less of a cost burden in this administrative function. Although such facilities might not be monitoring with the same frequency or for the same chemicals as will be required under an IL Standards permit, EPA anticipates that the administrative costs of permitting a facility that is already familiar with monitoring techniques will be less than those for facilities with no monitoring experience. For this analysis, the approximately 75 percent of facilities that are currently

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[5] For more detailed information on the methodology and data sources for this analysis, see U.S. EPA, 1995. *Regulatory Impact Analysis of Proposed Effluent Limitations Guidelines and Standards for the Metal Products and Machinery Industry (Phase I).* Appendix E. Office of Water (EPA 821-R-95-023), April.

[6] U.S. EPA, 1995. *Op. cit.*

monitoring their discharge streams were assumed to require one-half as much technical guidance as facilities that do not currently monitor.[7]

- Second, the specific form of permits—that is, concentration-based or mass-based limits—that will be written under the IL Standards has not been decided. Because it is typically more costly to prepare a mass-based permit than a concentration-based permit, the extent to which permitting authorities write mass-based permits will influence the administrative costs of the regulation. For this analysis, EPA assumed two cases. The first, and lower-cost, case assumes that all permits will be written on the basis of concentration limits. The second, and higher-cost, case assumes that permits for facilities discharging more than 6.25 million gallons per year[8] will be written as mass-based permits, with permits for smaller facilities written as concentration-based permits. In the estimated population of 1,606 nonexcluded facilities, approximately 76 percent are estimated to discharge more than 6.25 million gallons per year and thus are affected by the alternate case assumption.

Table 10-2 summarizes the results from this analysis. For the case in which all facilities are assumed to be issued concentration-based permits, the total present value of costs over the 16-year period following rule promulgation (allowing for a 1-year installation/implementation schedule, with permitting occurring at the end of that time) ranges from $9.7 million to $43.8 million, while the annualized cost ranges from $1.1 million to $4.6 million per year ($1993). For the case in which facilities discharging more than 6.25 million gallons per year are assumed to be issued mass-based permits, the estimated administrative costs are slightly higher. The total present value of costs for the 16-year period ranges from $9.9 to $45.1 million, while annualized costs range from $1.0 million to $4.5 million per year ($ 1993). The $2.6 million shown for the average of the mass-based case is carried through as a point estimate of the administrative cost of the rule.

10.2.2.3 Unemployment Costs

EPA does not calculate an additional cost of unemployment based on the willingness of workers to pay to avoid unemployment (although the Agency does compute the cost of administering unemployment benefits to workers in facilities projected to close post compliance later in this section) for the following reason. It is important to recall that EPA estimates the cost of the regulation as the cost to all facilities—both

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[7] This assumption causes only a small reduction—about 5 percent—in the estimate of the regulation's administrative cost.

[8] This annual discharge volume is frequently used to identify so-called "significant industrial dischargers."

Table 10-2

Estimated Costs of Administering the Proposed Industrial Laundry Regulation ($ million, 1993)

Scenario	Present Value of Cost Over 16 Years Following Promulgation			Annualized Cost		
	Low	Average	High	Low	Average	High
All Facilities Issued Concentration-Based Permits	$9.7	$25.1	$43.8	$1.0	$2.5	$4.3
Facilities Discharging More than 6.25 Million Gallons per Year Issue Mass-Based Permits	$9.9	$25.9	$45.1	$1.0	$2.6	$4.5

Source: U.S. EPA estimates (see text).

those that would stay open and incur compliance costs and those that are estimated to close and not incur these costs. The social cost of worker displacement is reflected in workers' willingness to pay to avoid unemployment. If the workers' willingness to pay to avoid unemployment exceeds the pollution control cost (assuming the ability of labor and management to negotiate a solution, e.g., wage cuts for workers), then pollution control equipment would be installed and operated at the facility. If the pollution control cost exceeds the willingness (or the ability) of workers to pay to avoid facility closure, then retaining that cost in the industry-wide estimate provides an upper bound for the social cost of the proposed regulation, including the cost of worker dislocation. In other words, the social costs of worker dislocation should not be added to the estimated cost of the regulation when the costs of compliance at facilities that close due to the regulation are included in that estimate, because to do so would be double-counting. Therefore, EPA assumes that the cost of compliance at facilities that are estimated to close as a result of the proposed regulation is the upper limit estimate of workers' willingness to pay to avoid unemployment (plus any liquidation costs; see discussion above). Thus, EPA does not add a willingness to pay to avoid unemployment to the costs of worker dislocations.

On the other hand, unemployment benefits administration costs are an additional social cost that must be considered. One recent EPA RIA has provided information on unemployment benefits administration costs, noting that they are about $100 per laid-off worker (a one-time cost).[9] The maximum number of worker dislocations estimated in Section Seven are those estimated based on output losses in the U.S. economy. The CP option is associated with total maximum, nationwide employment losses of 9,892 FTEs. Note that this estimate overstates total dislocations, since many of these losses are offset by sizable gains (see Section Seven), some which may occur within the same facility (e.g., production worker becomes pollution control equipment operator). Furthermore, these losses are really hours lost, not necessarily workers lost. These losses therefore most likely substantially overstate actual job losses. As noted in Section Seven, if these losses were distributed over the entire labor force to which they apply, a total of only 5 to 10 minutes would be lost per worker per year, and it is possible that no actual jobs would be lost. EPA, however, conservatively uses the 9,892 FTEs to mean jobs. EPA estimates that maximum unemployment benefits administration costs would be $989,200. Over the 16-year time frame of the analysis and at a 7 percent discount rate, this cost is $104,700 per year. Table 10-3 shows the annual costs for the other options, which range from $50,300 to $135,400.

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[9] U.S. EPA, 1995. *Op. cit.*

Table 10-3

Total Social Costs (1993 Dollars)

Option	Total Compliance Cost	Total Permitting Administrative Cost	Total Employment Benefit Administrative Cost	Total Social Cost
OC	$59,431,680	$2,600,000	$50,300	$62,081,980
CP	$123,384,086	$2,600,000	$104,700	$126,088,786
COMBO	$131,269,785	$2,600,000	$111,400	$133,981,185
DAF	$159,931,631	$2,600,000	$135,400	$162,667,031

Source: Tables 10-1, 10-2, and text.

Note that a multifacility firm might consider increased unemployment insurance premiums in its decision to close a facility. Because compliance costs for facilities owned by multifacility firms are already included in the estimate of social costs, to the extent such increased premiums are used to pay for the costs of administering unemployment benefits, adding these costs to the compliance costs of facilities that close postcompliance will overstate costs. Since no facilities owned by multifacility firms are estimated to close post compliance, however, this is not at issue.

10.2.2.4 Total Social Costs

Table 10-3 presents the total social costs associated with each of the options considered for the proposed rule. These costs range from $62.1 million to $162.7 million annually, depending on the option. The preferred option, CP, is associated with annual total social costs of $126.1 million.

10.3 POLLUTANT REDUCTIONS

Tables 10-4 through 10-7 present the results of EPA's loadings estimates by option (see EPA's Development Document for how the loadings and loadings reductions were calculated). The table presents raw loads, baseline loads, and postcompliance loads, along with load reductions in both pounds and in pounds-equivalent (PE), which are calculated on the basis of toxic weighting factors (TWFs). TWFs allow EPA to weight the pounds removed by the relative toxicity of each pollutant for which a removal is measured. EPA's *Cost -Effectiveness Analysis for Proposed Pretreatment Standards for Existing and New Sources for the Industrial Laundries Point Source Category* discusses in detail how PEs are calculated. The preferred option, CP, is associated with postcompliance removals of 27.3 million pounds and 407,358 PEs from waters of the U.S. This option removes more pounds than any other option except DAF and more PEs than any other option.

Table 10-4
Industry Loads and Removals by Pollutant
OC Option

Pollutant Code	Analyte	Industry Baseline Load (lb/yr)	Industry Treated Load (lb/yr)	Removals (lbs/yr)	POTW Removal Efficiency (%)	Removals After POTW (lbs/yr)	Toxic Weighting Factor	PE Removal
T11	1,1,1-TRICHLOROETHANE	56,458	45,282	11,176	0%	11,176	4.30E-03	48
T37	1,2-DIPHENYLHYDRAZINE	0	0	0	62%	0	1.20E+00	0
N34	2-BUTANONE	28,645	16,645	12,000	0%	12,000	2.20E-05	0
N38	2-METHYLNAPHTHALENE	9,280	3,049	6,230	28%	4,486	1.80E-02	81
N42	2-PROPANONE	160,369	80,343	80,026	84%	12,804	7.60E-06	0
T22	4-CHLORO-3-METHYLPHENOL	12,774	12,774	0	63%	0	4.30E-03	0
N54	4-METHYL-2-PENTANONE	19,278	13,376	5,902	0%	5,902	1.20E-04	1
N58	ALPHA-TERPINEOL	12,512	6,820	5,691	0%	5,691	1.00E-03	6
AL	ALUMINUM	673,267	673,267	0	88%	0	6.40E-02	0
SB	ANTIMONY	32,101	32,101	0	72%	0	1.90E-01	0
AS	ARSENIC	13,013	13,013	0	40%	0	4.00E+00	0
BA	BARIUM	71,391	71,391	0	35%	0	2.00E-03	0
N64	BENZOIC ACID	78,273	78,273	0	81%	0	3.30E-04	0
N66	BENZYL ALCOHOL	32,522	32,522	0	0%	0	5.60E-03	0
BE	BERYLLIUM	31	31	0	61%	0	5.30E+00	0
T66	BIS(2-ETHYLHEXYL) PHTHALATE	133,020	133,020	0	60%	0	1.10E-01	0
BOD	BOD 5-DAY (CARBONACEOUS)	113,260,559	113,260,559	0	91%	0	0.00E+00	0
B	BORON	34,470	34,470	0	14%	0	1.80E-01	0
T67	BUTYL BENZYL PHTHALATE	30,064	17,432	12,632	86%	1,768	2.30E-02	41
CD	CADMIUM	5,561	5,561	0	91%	0	5.20E+00	0
COD	CHEMICAL OXYGEN DEMAND (COD)	265,197,924	265,197,924	0	82%	0	0.00E+00	0
T7	CHLOROBENZENE	2,714	897	1,816	0%	1,816	2.90E-03	5
T23	CHLOROFORM	125,352	129,011	(3,659)	0%	(3,659)	2.10E-03	(8)
CR	CHROMIUM	14,533	14,533	0	91%	0	2.70E-02	0
CO	COBALT	5,264	5,264	0	4%	0	1.10E-01	0
CU	COPPER	122,556	122,556	0	84%	0	4.70E-01	0
T68	DI-N-BUTYL PHTHALATE	10,143	10,143	0	75%	0	1.20E-02	0
T69	DI-N-OCTYL PHTHALATE	11,339	11,339	0	0%	0	2.20E-01	0
T38	ETHYLBENZENE	44,621	14,363	30,258	0%	30,258	1.40E-03	42
N90	HEXANOIC ACID	8,389	8,389	0	0%	0	3.40E-04	0
FE	IRON	1,111,476	1,111,476	0	83%	0	5.60E-03	0
T54	ISOPHORONE	4,504	4,504	0	62%	0	7.30E-04	0
PB	LEAD	73,452	73,452	0	92%	0	1.80E+00	0
N95	M-XYLENE	21,366	14,595	6,770	0%	6,770	1.50E-03	10
MN	MANGANESE	23,929	23,929	0	41%	0	1.40E-02	0
HG	MERCURY	174	174	0	0%	0	5.00E+02	0
T44	METHYLENE CHLORIDE	35,480	16,778	18,701	0%	18,701	4.20E-04	8
MO	MOLYBDENUM	9,810	9,810	0	52%	0	2.00E-01	0
N102	N-DECANE	686,923	417,706	269,217	0%	269,217	4.30E-03	1,158
N103	N-DOCOSANE	12,325	12,325	0	65%	0	8.20E-05	0
N104	N-DODECANE	172,443	82,141	90,302	0%	90,302	4.30E-03	388
N105	N-EICOSANE	163,512	163,512	0	0%	0	4.30E-03	0
N106	N-HEXACOSANE	17,892	10,905	6,987	65%	2,445	8.20E-05	0
N107	N-HEXADECANE	78,453	78,453	0	0%	0	4.30E-03	0
N114	N-OCTACOSANE	11,308	8,100	3,209	65%	1,123	8.20E-05	0
N115	N-OCTADECANE	66,428	66,428	0	0%	0	4.30E-03	0
N116	N-TETRACOSANE	15,405	15,405	0	65%	0	8.20E-05	0
N117	N-TETRADECANE	112,217	112,217	0	0%	0	4.30E-03	0
N118	N-TRIACONTANE	14,897	10,494	4,403	65%	1,541	8.20E-05	0
T55	NAPHTHALENE	38,713	18,592	20,121	0%	20,121	1.50E-02	302
NI	NICKEL	14,777	14,777	0	52%	0	3.60E-02	0
N119	O+P XYLENE	10,774	7,906	2,868	0%	2,868	8.50E-03	24
HEM	OIL AND GREASE (AS HEM)	35,873,692	35,873,692	0	87%	0	0.00E+00	0
N125	P-CRESOL	0	0	0	72%	0	2.40E-03	0
N126	P-CYMENE	57,874	19,102	38,772	99%	388	4.30E-02	17
N130	PENTAMETHYLBENZENE	0	0	0	91%	0	2.90E-01	0
T65	PHENOL	13,649	13,649	0	95%	0	2.80E-02	0
SE	SELENIUM	99	99	0	34%	0	1.10E+00	0
AG	SILVER	4,560	4,560	0	80%	0	4.70E+01	0
T85	TETRACHLOROETHENE	42,026	3,817	38,209	0%	38,209	7.40E-02	2,827
TL	THALLIUM	0	0	0	28%	0	1.40E-01	0
SN	TIN	5,760	5,760	0	65%	0	3.00E-01	0
TI	TITANIUM	13,986	13,986	0	69%	0	2.90E-02	0
T86	TOLUENE	72,921	42,062	30,858	0%	30,858	5.60E-03	173
TOC	TOTAL ORGANIC CARBON (TOC)	80,496,673	80,496,673	0	71%	0	0.00E+00	0
SHEM	TOTAL PETROLEUM HYDROCARBON (AS SG	13,242,028	13,242,028	0	65%	0	1.00E-01	0
TS	TOTAL SUSPENDED SOLIDS	62,793,110	62,793,110	0	91%	0	0.00E+00	0
T30	TRANS-1,2-DICHLOROETHENE	3,909	933	2,976	0%	2,976	9.30E-05	0
T87	TRICHLOROETHENE	3,334	892	2,443	0%	2,443	6.30E-02	154
V	VANADIUM	1,658	1,658	0	42%	0	6.20E-01	0
Y	YTTRIUM	648	648	0	58%	0	0.00E+00	0
ZN	ZINC	194,171	194,171	0	77%	0	5.10E-02	0
	Totals	575,722,778	575,024,870	697,908		570,205		5,278

Source: Development Document.

Table 10-5
Industry Loads and Removals by Pollutant
CP Option

Pollutant Code	Analyte	Industry Baseline Load (lb/yr)	Industry Treated Load (lb/yr)	Removals (lbs/yr)	POTW Removal Efficiency (%)	Removals After POTW (lbs/yr)	Toxic Weighting Factor	PE Removal
T11	1,1,1-TRICHLOROETHANE	56,458	31,647	24,811	0%	24,811	4.30E-03	107
T37	1,2-DIPHENYLHYDRAZINE	0	0	0	62%	0	1.20E+00	0
N34	2-BUTANONE	28,645	28,645	0	0%	0	2.20E-05	0
N38	2-METHYLNAPHTHALENE	9,280	3,080	6,199	28%	4,463	1.80E-02	80
N42	2-PROPANONE	160,369	160,369	0	84%	0	7.60E-06	0
T22	4-CHLORO-3-METHYLPHENOL	12,774	3,513	9,261	63%	3,427	4.30E-03	15
N54	4-METHYL-2-PENTANONE	19,278	19,278	0	0%	0	1.20E-04	0
N58	ALPHA-TERPINEOL	12,512	12,512	0	0%	0	1.00E-03	0
AL	ALUMINUM	673,267	413,096	260,172	88%	31,221	6.40E-02	1,998
SB	ANTIMONY	32,101	16,110	15,991	72%	4,477	1.90E-01	851
AS	ARSENIC	13,013	13,011	2	40%	1	4.00E+00	4
BA	BARIUM	71,391	57,034	14,356	35%	9,332	2.00E-03	19
N64	BENZOIC ACID	78,273	78,273	0	81%	0	3.30E-04	0
N66	BENZYL ALCOHOL	32,522	32,522	0	0%	0	5.60E-03	0
BE	BERYLLIUM	31	30	0	61%	0	5.30E+00	1
T66	BIS(2-ETHYLHEXYL) PHTHALATE	133,020	82,027	50,993	60%	20,397	1.10E-01	2,244
BOD	BOD 5-DAY (CARBONACEOUS)	113,260,559	106,929,464	6,331,095	91%	569,799	0.00E+00	0
B	BORON	34,470	29,154	5,316	14%	4,571	1.80E-01	823
T67	BUTYL BENZYL PHTHALATE	30,064	14,524	15,540	86%	2,176	2.30E-02	50
CD	CADMIUM	5,561	2,977	2,584	91%	233	5.20E+00	1,209
COD	CHEMICAL OXYGEN DEMAND (COD)	265,197,924	184,207,948	80,989,976	82%	14,578,196	0.00E+00	0
T7	CHLOROBENZENE	2,714	1,863	851	0%	851	2.90E-03	2
T23	CHLOROFORM	125,352	125,351	1	0%	1	2.10E-03	0
CR	CHROMIUM	14,533	8,989	5,544	91%	499	2.70E-02	13
CO	COBALT	5,264	3,539	1,725	4%	1,656	1.10E-01	182
CU	COPPER	122,556	60,664	61,892	84%	9,903	4.70E-01	4,654
T68	DI-N-BUTYL PHTHALATE	10,143	5,676	4,467	75%	1,117	1.20E-02	13
T69	DI-N-OCTYL PHTHALATE	11,339	9,949	1,389	0%	1,389	2.20E-01	306
T38	ETHYLBENZENE	44,621	20,292	24,329	0%	24,329	1.40E-03	34
N90	HEXANOIC ACID	8,389	8,389	0	0%	0	3.40E-04	0
FE	IRON	1,111,476	712,723	398,753	83%	67,788	5.60E-03	380
T54	ISOPHORONE	4,504	4,504	0	62%	0	7.30E-04	0
PB	LEAD	73,452	27,159	46,293	92%	3,703	1.80E+00	6,666
N95	M-XYLENE	21,366	19,692	1,674	0%	1,674	1.50E-03	3
MN	MANGANESE	23,929	10,719	13,210	41%	7,794	1.40E-02	109
HG	MERCURY	174	174	0	0%	0	5.00E+02	0
T44	METHYLENE CHLORIDE	35,480	11,824	23,656	0%	23,656	4.20E-04	10
MO	MOLYBDENUM	9,810	9,810	0	52%	0	2.00E-01	0
N102	N-DECANE	686,923	346,103	340,821	0%	340,821	0.00E+00	0
N103	N-DOCOSANE	12,325	5,804	6,521	65%	2,282	0.00E+00	0
N104	N-DODECANE	172,443	156,037	16,406	0%	16,406	0.00E+00	0
N105	N-EICOSANE	163,512	12,358	151,154	0%	151,154	0.00E+00	0
N106	N-HEXACOSANE	17,892	4,347	13,545	65%	4,741	0.00E+00	0
N107	N-HEXADECANE	78,453	26,293	52,160	0%	52,160	0.00E+00	0
N114	N-OCTACOSANE	11,308	3,816	7,493	65%	2,623	0.00E+00	0
N115	N-OCTADECANE	66,428	11,822	54,606	0%	54,606	0.00E+00	0
N116	N-TETRACOSANE	15,405	8,707	6,698	65%	2,344	0.00E+00	0
N117	N-TETRADECANE	112,217	23,201	89,016	0%	89,016	0.00E+00	0
N118	N-TRIACONTANE	14,897	7,541	7,356	65%	2,574	0.00E+00	0
T55	NAPHTHALENE	38,713	18,835	19,878	0%	19,878	1.50E-02	298
NI	NICKEL	14,777	10,266	4,511	52%	2,165	3.60E-02	78
N119	O+P XYLENE	10,774	9,979	795	0%	795	8.50E-03	7
HEM	OIL AND GREASE (AS HEM)	35,873,692	15,180,786	20,692,906	87%	2,690,078	0.00E+00	0
N125	P-CRESOL	0	0	0	72%	0	2.40E-03	0
N126	P-CYMENE	57,874	57,874	0	99%	0	4.30E-02	0
N130	PENTAMETHYLBENZENE	0	0	0	91%	0	2.90E-01	0
T65	PHENOL	13,649	13,649	0	95%	0	2.80E-02	0
SE	SELENIUM	99	99	0	34%	0	1.10E+00	0
AG	SILVER	4,560	4,087	473	80%	95	4.70E+01	4,443
T85	TETRACHLOROETHENE	42,026	20,782	21,244	0%	21,244	7.40E-02	1,572
TL	THALLIUM	0	0	0	28%	0	1.40E-01	0
SN	TIN	5,760	900	4,861	65%	1,701	3.00E-01	510
TI	TITANIUM	13,986	9,326	4,660	69%	1,445	2.90E-02	42
T86	TOLUENE	72,921	59,128	13,792	0%	13,792	5.60E-03	77
TOC	TOTAL ORGANIC CARBON (TOC)	80,496,673	74,086,442	6,410,230	71%	1,858,967	0.00E+00	0
SHEM	TOTAL PETROLEUM HYDROCARBON (AS SG	13,242,028	2,414,527	10,827,501	65%	3,789,625	1.00E-01	378,963
TS	TOTAL SUSPENDED SOLIDS	62,793,110	32,114,458	30,678,652	91%	2,761,079	0.00E+00	0
T30	TRANS-1,2-DICHLOROETHENE	3,909	3,909	0	0%	0	9.30E-05	0
T87	TRICHLOROETHENE	3,334	3,334	0	0%	0	6.30E-02	0
V	VANADIUM	1,658	1,644	14	42%	8	6.20E-01	5
Y	YTTRIUM	648	648	0	58%	0	0.00E+00	0
ZN	ZINC	194,171	58,577	135,593	77%	31,186	5.10E-02	1,591
	Totals	575,722,778	417,851,812	157,870,966		27,308,247		407,358

Source: Development Document.

Table 10-6
Industry Loads and Removals by Pollutant
COMBO Option

Pollutant Code	Analyte	Industry Baseline Load (lb/yr)	Industry Treated Load (lb/yr)	Removals (lbs/yr)	POTW Removal Efficiency (%)	Removals After POTW (lbs/yr)	Toxic Weighting Factor	PE Removal
T11	1,1,1-TRICHLOROETHANE	56,458	31,647	24,811	0%	24,811	4.30E-03	107
T37	1,2-DIPHENYLHYDRAZINE	0	0	0	62%	0	1.20E+00	0
N34	2-BUTANONE	28,645	28,645	0	0%	0	2.20E-05	0
N38	2-METHYLNAPHTHALENE	9,280	8,274	1,006	28%	724	1.80E-02	13
N42	2-PROPANONE	160,369	160,369	0	84%	0	7.60E-06	0
T22	4-CHLORO-3-METHYLPHENOL	12,774	10,714	2,061	63%	762	4.30E-03	3
N54	4-METHYL-2-PENTANONE	19,278	19,278	0	0%	0	1.20E-04	0
N58	ALPHA-TERPINEOL	12,512	12,485	26	0%	26	1.00E-03	0
AL	ALUMINUM	673,267	478,212	195,056	88%	23,407	6.40E-02	1,498
SB	ANTIMONY	32,101	19,230	12,871	72%	3,604	1.90E-01	685
AS	ARSENIC	13,013	13,012	1	40%	0	4.00E+00	1
BA	BARIUM	71,391	57,034	14,356	35%	9,332	2.00E-03	19
N64	BENZOIC ACID	78,273	76,861	1,412	81%	268	3.30E-04	0
N66	BENZYL ALCOHOL	32,522	32,522	0	0%	0	5.60E-03	0
BE	BERYLLIUM	31	31	0	61%	0	5.30E+00	0
T66	BIS(2-ETHYLHEXYL) PHTHALATE	133,020	84,742	48,278	60%	19,311	1.10E-01	2,124
BOD	BOD 5-DAY (CARBONACEOUS)	113,260,559	106,935,931	6,324,628	91%	569,217	0.00E+00	0
B	BORON	34,470	33,931	539	14%	463	1.80E-01	83
T67	BUTYL BENZYL PHTHALATE	30,064	20,325	9,739	86%	1,363	2.30E-02	31
CD	CADMIUM	5,561	3,565	1,997	91%	180	5.20E+00	934
COD	CHEMICAL OXYGEN DEMAND (COD)	265,197,924	184,256,521	80,941,404	82%	14,569,453	0.00E+00	0
T7	CHLOROBENZENE	2,714	1,874	839	0%	839	2.90E-03	2
T23	CHLOROFORM	125,352	125,352	0	0%	0	2.10E-03	0
CR	CHROMIUM	14,533	10,906	3,627	91%	326	2.70E-02	9
CO	COBALT	5,264	3,850	1,414	4%	1,358	1.10E-01	149
CU	COPPER	122,556	86,855	35,701	84%	5,712	4.70E-01	2,685
T68	DI-N-BUTYL PHTHALATE	10,143	8,140	2,003	75%	501	1.20E-02	6
T69	DI-N-OCTYL PHTHALATE	11,339	9,949	1,389	0%	1,389	2.20E-01	306
T38	ETHYLBENZENE	44,621	20,293	24,327	0%	24,327	1.40E-03	34
N90	HEXANOIC ACID	8,389	8,389	0	0%	0	3.40E-04	0
FE	IRON	1,111,476	712,723	398,753	83%	67,788	5.60E-03	380
T54	ISOPHORONE	4,504	4,504	0	62%	0	7.30E-04	0
PB	LEAD	73,452	33,242	40,210	92%	3,217	1.80E+00	5,790
N95	M-XYLENE	21,366	19,868	1,498	0%	1,498	1.50E-03	2
MN	MANGANESE	23,929	12,683	11,245	41%	6,635	1.40E-02	93
HG	MERCURY	174	156	18	0%	18	5.00E+02	8,866
T44	METHYLENE CHLORIDE	35,480	31,665	3,815	0%	3,815	4.20E-04	2
MO	MOLYBDENUM	9,810	9,810	0	52%	0	2.00E-01	0
N102	N-DECANE	686,923	372,763	314,161	0%	314,161	0.00E+00	0
N103	N-DOCOSANE	12,325	6,740	5,585	65%	1,955	0.00E+00	0
N104	N-DODECANE	172,443	156,037	16,406	0%	16,406	0.00E+00	0
N105	N-EICOSANE	163,512	14,750	148,762	0%	148,762	0.00E+00	0
N106	N-HEXACOSANE	17,892	4,720	13,172	65%	4,610	0.00E+00	0
N107	N-HEXADECANE	78,453	27,414	51,039	0%	51,039	0.00E+00	0
N114	N-OCTACOSANE	11,308	3,816	7,493	65%	2,623	0.00E+00	0
N115	N-OCTADECANE	66,428	14,778	51,649	0%	51,649	0.00E+00	0
N116	N-TETRACOSANE	15,405	9,537	5,869	65%	2,054	0.00E+00	0
N117	N-TETRADECANE	112,217	24,343	87,873	0%	87,873	0.00E+00	0
N118	N-TRIACONTANE	14,897	7,541	7,356	65%	2,574	0.00E+00	0
T55	NAPHTHALENE	38,713	20,132	18,580	0%	18,580	1.50E-02	279
NI	NICKEL	14,777	10,629	4,148	52%	1,991	3.60E-02	72
N119	O+P XYLENE	10,774	10,379	395	0%	395	8.50E-03	3
HEM	OIL AND GREASE (AS HEM)	35,873,692	15,880,079	19,993,613	87%	2,599,170	0.00E+00	0
N125	P-CRESOL	0	0	0	72%	0	2.40E-03	0
N126	P-CYMENE	57,874	23,954	33,920	99%	339	4.30E-02	15
N130	PENTAMETHYLBENZENE	0	0	0	91%	0	2.90E-01	0
T65	PHENOL	13,649	13,637	12	95%	1	2.80E-02	0
SE	SELENIUM	99	99	0	34%	0	1.10E+00	0
AG	SILVER	4,560	4,087	472	80%	94	4.70E+01	4,441
T85	TETRACHLOROETHENE	42,026	21,005	21,021	0%	21,021	7.40E-02	1,556
TL	THALLIUM	0	0	0	28%	0	1.40E-01	0
SN	TIN	5,760	4,779	981	65%	343	3.00E-01	103
TI	TITANIUM	13,986	9,326	4,660	69%	1,445	2.90E-02	42
T86	TOLUENE	72,921	59,200	13,721	0%	13,721	5.60E-03	77
TOC	TOTAL ORGANIC CARBON (TOC)	80,496,673	74,088,883	6,407,789	71%	1,858,259	0.00E+00	0
SHEM	TOTAL PETROLEUM HYDROCARBON (AS SG	13,242,028	2,646,314	10,595,713	65%	3,708,500	1.00E-01	370,850
TS	TOTAL SUSPENDED SOLIDS	62,793,110	32,114,458	30,678,652	91%	2,761,079	0.00E+00	0
T30	TRANS-1,2-DICHLOROETHENE	3,909	3,909	0	0%	0	9.30E-05	0
T87	TRICHLOROETHENE	3,334	3,334	0	0%	0	6.30E-02	0
V	VANADIUM	1,658	1,644	14	42%	8	6.20E-01	5
Y	YTTRIUM	648	648	0	58%	0	0.00E+00	0
ZN	ZINC	194,171	109,873	84,297	77%	19,388	5.10E-02	989
	Totals	575,722,778	419,052,398	156,670,380		27,028,386		402,253

Source: Development Document.

Table 10-7
Industry Loads and Removals by Pollutant
DAF Option

Pollutant Code	Analyte	Industry Baseline Load (lb/yr)	Industry Treated Load (lb/yr)	Removals (lbs/yr)	POTW Removal Efficiency (%)	Removals After POTW (lbs/yr)	Toxic Weighting Factor	PE Removal
T11	1,1,1-TRICHLOROETHANE	56,458	3,489	52,970	0%	52,970	4E-03	228
T37	1,2-DIPHENYLHYDRAZINE	0	0	0	62%	0	1E+00	0
N34	2-BUTANONE	28,645	28,645	0	0%	0	2E-05	0
N38	2-METHYLNAPHTHALENE	9,280	8,274	1,006	28%	724	2E-02	13
N42	2-PROPANONE	160,369	160,369	0	84%	0	8E-06	0
T22	4-CHLORO-3-METHYLPHENOL	12,774	10,714	2,061	63%	762	4E-03	3
N54	4-METHYL-2-PENTANONE	19,278	19,076	202	0%	202	1E-04	0
N58	ALPHA-TERPINEOL	12,512	12,485	26	0%	26	1E-03	0
AL	ALUMINUM	673,267	478,212	195,056	88%	23,407	6E-02	1,498
SB	ANTIMONY	32,101	19,230	12,871	72%	3,604	2E-01	685
AS	ARSENIC	13,013	13,012	1	40%	0	4E+00	1
BA	BARIUM	71,391	43,646	27,745	35%	18,034	2E-03	36
N64	BENZOIC ACID	78,273	76,861	1,412	81%	268	3E-04	0
N66	BENZYL ALCOHOL	32,522	32,522	0	0%	0	6E-03	0
BE	BERYLLIUM	31	31	0	61%	0	5E+00	0
T66	BIS(2-ETHYLHEXYL) PHTHALATE	133,020	84,742	48,278	60%	19,311	1E-01	2,124
BOD	BOD 5-DAY (CARBONACEOUS)	113,260,559	106,879,999	6,380,560	91%	574,250	0E+00	0
B	BORON	34,470	33,931	539	14%	463	2E-01	83
T67	BUTYL BENZYL PHTHALATE	30,064	20,325	9,739	86%	1,363	2E-02	31
CD	CADMIUM	5,561	3,565	1,997	91%	180	5E+00	934
COD	CHEMICAL OXYGEN DEMAND (COD)	265,197,924	178,964,957	86,232,967	82%	15,521,934	0E+00	0
T7	CHLOROBENZENE	2,714	1,740	974	0%	974	3E-03	3
T23	CHLOROFORM	125,352	125,352	0	0%	0	2E-03	0
CR	CHROMIUM	14,533	10,906	3,627	91%	326	3E-02	9
CO	COBALT	5,264	3,850	1,414	4%	1,358	1E-01	149
CU	COPPER	122,556	86,855	35,701	84%	5,712	5E-01	2,685
T68	DI-N-BUTYL PHTHALATE	10,143	8,140	2,003	75%	501	1E-02	6
T69	DI-N-OCTYL PHTHALATE	11,339	9,591	1,748	0%	1,748	2E-01	385
T38	ETHYLBENZENE	44,621	6,559	38,062	0%	38,062	1E-03	53
N90	HEXANOIC ACID	8,389	8,389	0	0%	0	3E-04	0
FE	IRON	1,111,476	621,491	489,985	83%	83,297	6E-03	466
T54	ISOPHORONE	4,504	4,504	0	62%	0	7E-04	0
PB	LEAD	73,452	33,242	40,210	92%	3,217	2E+00	5,790
N95	M-XYLENE	21,366	19,497	1,869	0%	1,869	2E-03	3
MN	MANGANESE	23,929	12,683	11,245	41%	6,635	1E-02	93
HG	MERCURY	174	156	18	0%	18	5E+02	8,866
T44	METHYLENE CHLORIDE	35,480	31,665	3,815	0%	3,815	4E-04	2
MO	MOLYBDENUM	9,810	8,997	813	52%	390	2E-01	78
N102	N-DECANE	686,923	372,763	314,161	0%	314,161	0E+00	0
N103	N-DOCOSANE	12,325	6,740	5,585	65%	1,955	0E+00	0
N104	N-DODECANE	172,443	59,948	112,495	0%	112,495	0E+00	0
N105	N-EICOSANE	163,512	14,750	148,762	0%	148,762	0E+00	0
N106	N-HEXACOSANE	17,892	4,720	13,172	65%	4,610	0E+00	0
N107	N-HEXADECANE	78,453	27,414	51,039	0%	51,039	0E+00	0
N114	N-OCTACOSANE	11,308	3,366	7,943	65%	2,780	0E+00	0
N115	N-OCTADECANE	66,428	14,778	51,649	0%	51,649	0E+00	0
N116	N-TETRACOSANE	15,405	9,537	5,869	65%	2,054	0E+00	0
N117	N-TETRADECANE	112,217	24,343	87,873	0%	87,873	0E+00	0
N118	N-TRIACONTANE	14,897	7,273	7,625	65%	2,669	0E+00	0
T55	NAPHTHALENE	38,713	20,132	18,580	0%	18,580	2E-02	279
NI	NICKEL	14,777	10,629	4,148	52%	1,991	4E-02	72
N119	O+P XYLENE	10,774	10,379	395	0%	395	9E-03	3
HEM	OIL AND GREASE (AS HEM)	35,873,692	15,880,079	19,993,613	87%	2,599,170	0E+00	0
N125	P-CRESOL	0	0	0	72%	0	2E-03	0
N126	P-CYMENE	57,874	23,954	33,920	99%	339	4E-02	15
N130	PENTAMETHYLBENZENE	0	0	0	91%	0	3E-01	0
T65	PHENOL	13,649	13,637	12	95%	1	3E-02	0
SE	SELENIUM	99	99	0	34%	0	1E+00	0
AG	SILVER	4,560	4,069	490	80%	98	5E+01	4,610
T85	TETRACHLOROETHENE	42,026	20,463	21,563	0%	21,563	7E-02	1,596
TL	THALLIUM	0	0	0	28%	0	1E-01	0
SN	TIN	5,760	4,779	981	65%	343	3E-01	103
TI	TITANIUM	13,986	8,858	5,128	69%	1,590	3E-02	46
T86	TOLUENE	72,921	51,663	21,258	0%	21,258	6E-03	119
TOC	TOTAL ORGANIC CARBON (TOC)	80,496,673	73,470,522	7,026,150	71%	2,037,584	0E+00	0
SHEM	TOTAL PETROLEUM HYDROCARBON (AS SG	13,242,028	2,646,314	10,595,713	65%	3,708,500	1E-01	370,850
TS	TOTAL SUSPENDED SOLIDS	62,793,110	29,721,017	33,072,094	91%	2,976,488	0E+00	0
T30	TRANS-1,2-DICHLOROETHENE	3,909	3,909	0	0%	0	9E-05	0
T87	TRICHLOROETHENE	3,334	3,334	0	0%	0	6E-02	0
V	VANADIUM	1,658	1,619	40	42%	23	6E-01	14
Y	YTTRIUM	648	643	5	58%	2	0E+00	0
ZN	ZINC	194,171	109,873	84,297	77%	19,388	5E-02	989
	Totals	**575,722,778**	**410,439,304**	**165,283,474**		**28,552,783**		**402,921**

Source: Development Document.

10.4 BENEFITS ASSESSMENT

In this section, EPA assesses the expected benefits to society from the reduced effluent discharges that would result from the proposed IL Standards. The benefits of effluent discharge reductions can be classified into three broad categories: human health benefits, ecological benefits, and economic productivity benefits (including efficiency benefits at POTWs), each of which includes a number of more narrowly defined benefit categories. Because of imperfect understanding of the links between discharge reductions and benefit categories, and how society values some of the benefit events, however, EPA was not able to bring the same depth of analysis to all of these categories.

Although EPA endeavored to quantify and monetize as many benefit categories as possible, the benefit categories that could be quantified and monetized represent only a small share of the total set of benefits expected to accrue from the regulation. The monetized benefits assessed in this EA include reduced incidence of cancer among humans from consumption of contaminated fish; enhanced value of recreational fishing stemming from improved water quality; nonuse benefits; and increased quantity of sewage sludge that can be beneficially used more easily. Benefit measures attributed to reduced wastewater releases from industrial laundries facilities that were quantified but not monetized include reduced occurrence of in-stream pollutant concentrations in excess of human health-based toxic effect levels; reduced frequency of pollutant concentrations that exceed ambient water quality criteria (AWQC) for protection of aquatic species; and reduced interference with operations at POTWs and thus cost savings associated with greater operating efficiencies. Finally, nonquantified, nonmonetized benefits that are expected to result from the regulation include enhanced diversionary uses;[10] improved aesthetic quality of waters near the discharge sites; enhanced water-dependent recreation other than fishing; benefits to wildlife and to threatened or endangered species; and improved tourism opportunities.

Section 10.4.1 qualitatively discusses the categories of benefits that are likely to be achieved by the IL Standards. Section 10.4.2 analyzes the human health-related benefits in two categories: reduction in cancer

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[10] Diversionary uses include municipal drinking water (treatment cost savings), agriculture (irrigation), and industrial and commercial uses (e.g., process and cooling water).

cases from consumption of chemically contaminated fish tissue and reduced frequency of pollutant concentrations in excess of health-based AWQC limits. Section 10.4.3 analyzes ecological benefits from reduced effluent discharges. Finally, Section 10.4.4 reviews two categories of expected economic productivity benefits: reduced interference with POTW processes and reduced contamination of sewage sludge at POTWs receiving discharges from industrial laundries facilities.

10.4.1 Overview of Benefits Expected from the IL Standards

Discharges from industrial laundries contain metal and organic toxic pollutants (i.e., priority pollutants), nonconventional pollutants, and conventional pollutants such as total suspended solids and oil and grease. Discharges of these pollutants to surface waters and POTWs can alter aquatic habitats, adversely affect the survivability and diversity of native aquatic life, and increase human health risk through the consumption of contaminated fish and water. In addition, many of these pollutants can disrupt biological wastewater treatment systems and contaminate sewage sludge. Benefits of reducing pollutant loads from industrial laundries facilities to the environment include reduced risk of cancer and noncancer human health risks, improved recreation opportunities (e.g., fishing and swimming), improved aquatic and benthic habitats, less costly disposal and increased beneficial use of sewage sludge, and cost savings from the reduced occurrence of POTW inhibition problems.

10.4.1.1 Pollutants of Concern

EPA conducted national sampling of industrial laundries facilities to determine the presence or absence of conventional, priority, and nonconventional pollutants in their discharge water. Using these sample data and applicable selection criteria, EPA identified 72 pollutants of concern for this industry, including 31 priority pollutants (18 priority organics and 13 priority metals) and 35 nonconventional pollutants (24 nonconventional organics and 11 nonconventional metals). Exhibit B-1 in Appendix B of the

Water Quality Benefits Analysis (WQBA)[11] lists the potential fate and toxicity of these 66 pollutants, as well as for one bulk nonconventional pollutant, total petroleum hydrocarbons (TPH).

Human and ecological exposure and risk from environmental releases of toxic chemicals depend on chemical-specific properties, the mechanism and media of release, and site-specific environmental conditions. Chemical-specific properties include toxicological effects on living organisms, hydrophobicity/lipophilicity, reactivity, and persistence. Based on available physical and chemical properties, as well as aquatic and human toxicity data, EPA identified that 17 pollutants exhibit moderate to high toxicity to aquatic life; 39 are human noncancer toxicants; 8 are classified as known or probable human carcinogens; 17 are designated as hazardous air pollutants (HAP) in wastewater; and 26 are RCRA pollutants. Also, 23 pollutants have a moderate to high potential to bioaccumulate in aquatic biota (potentially accumulating in the food chain and causing increased risk to higher trophic-level organisms and to exposed human populations via fish and shellfish consumption).

EPA did not evaluate the potential fate and toxicity of the three conventional pollutants (i.e., biochemical oxygen demand [BOD], total suspended solids, and oil and grease), and two of the three bulk nonconventional pollutants (chemical oxygen demand [COD]) and total organic carbon) that were identified as pollutants of concern in developing the proposed IL Standards.[12] The discharge of these pollutants, however, can have adverse effects on human health and the environment. For example, habitat degradation can result from increased suspended particulate matter that reduces light penetration and primary productivity or from accumulation of particles that alter benthic spawning grounds and feeding habitats. Oil and grease can have a lethal effect on fish by coating gill surfaces and causing asphyxia, depleting oxygen levels as a result of excessive biological oxygen demand, and inhibiting stream re-aeration by coating the water surface with an oil film. Oil and grease also can have detrimental effects on waterfowl by destroying the buoyancy and insulation of their feathers. High COD and BOD levels can deplete oxygen concentrations, which can result in mortality or other adverse effects on fish.

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[11] U.S. EPA, 1997. *Water Quality Benefits Analysis for Proposed Pretreatment Standards for Existing and New Sources for the Industrial Laundries Point Source Category.*

[12] EPA did analyze the fate and toxicity of one bulk nonconventional pollutant: TPH.

10.4.1.2 Qualitative Description of Benefits Expected from the IL Standards

This section provides an overview of the categories of benefits likely to be achieved by the IL Standards and the type of analysis undertaken for each category. Table 10-8 summarizes the different types of benefits that fall in each of the three benefit categories, and the following paragraphs describe each category of benefits likely to be achieved by the regulation.

The benefit analysis is based on all industrial laundry facilities that are expected to be subject to regulation including facilities identified in the economic impact analysis as potential baseline and postcompliance closures. As noted in Section 10.2.2, EPA assumed that the industrial laundries market is in equilibrium in the baseline and, accordingly, that the quantity of production from facilities exiting the market will be met by other existing or new facilities. As a result, the baseline effluent discharges from existing industrial laundry facilities and the estimated reductions in those discharges resulting from the regulation are not likely to be substantially affected by these potential closures.[13]

Human Health Effects

EPA believes the proposed regulation would assist in reducing pollutant concentrations to levels protective of human health in waterways receiving industrial laundries discharges. The benefits include both carcinogenic risks and noncancer hazards resulting from reduced exposure to toxic pollutants ingested through the consumption of fish by recreational and subsistence anglers and their families. The carcinogens identified by EPA are classified as known (A) or probable (B1 or B2) carcinogens (see Exhibit B-2 in Appendix B of the WQBA). Noncancer effects expected to be reduced by the proposed regulation include systemic effects (e.g., immunological, neurological, circulatory, or respiratory toxicity), reproductive toxicity, and developmental toxicity (see Exhibit B-2 in Appendix B of the WQBA).

Although EPA believes that the proposed regulation would reduce both carcinogenic effects and noncancer effects, this analysis quantitatively examines only reduction in cancer cases from consumption of

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[13] EPA also analyzed a separate case in which baseline closures were removed from the benefits assessment. The benefit results did not materially change in this analysis (see Section 5.6 of the WQBA).

Table 10-8

General Categories of Benefits Expected from the Industrial Laundry Regulation

Human Health Benefits
Reduced Cancer Risk
Reduced Noncancer Health Hazards
Ecological Benefits
Reduced Risk to Aquatic Life
Reduced Risk to Terrestrial Wildlife
Protection of Biodiversity
Protection of Cultural Valuation
Enhanced Recreational Opportunities such as fishing, boating, swimming, hunting, rafting, picnicking, birdwatching, photography, and hiking
Increased Aesthetic Benefits such as enhancement of adjoining site amenities (e.g., residing, working, traveling, and owning property near the water)
Reduced Contamination of Sediments
Existence Value
Option Value
Economic Productivity Benefits
Enhanced Tourism
Improved Commercial Fisheries Yields
Reduced Sewage Sludge Disposal Costs
Beneficial Use of Sewage Sludge via Land Application
Reduced Water Treatment Costs
Increased Property Values on or Near the Water

Source: U.S. EPA assessment of potential benefit categories for this rulemaking.

chemically contaminated fish tissue. The incidence of cancer was translated into an expected number of avoided cancer cases and, on that basis, monetized.

EPA also quantified but did not monetize the expected reduction of pollutant concentrations in excess of health-based AWQC limits. This benefit measure was obtained by comparing in-waterway pollutant concentrations to toxic effect levels.

Although EPA did not quantify noncancer health effects, the effect of contaminants, particularly of lead, on children and women of child-bearing age in families of subsistence anglers is a source of concern. Any reduction of lead consumption in this highly vulnerable group might be beneficial, particularly among young children whose blood lead levels are near to above 10 micrograms per deciliter, a level at which adverse effects in children have been noted.[14] EPA is currently planning to propose revisions to the AWQC for lead to be more protective of children's health. To the extent that the AWQCs for lead or other pollutants are lowered, this benefits analysis might not capture the full benefit of expected reductions in pollutant concentrations.

Ecological Benefits

By reducing pollutant concentrations to levels below those considered to affect biota adversely, the proposed regulation is expected to generate ecological and recreational benefits due to improved water quality. The expected ecological benefits include protection of both freshwater and saltwater organisms, as well as terrestrial wildlife and birds that consume aquatic organisms. The proposed regulation would relieve stressed aquatic ecosystems and would protect resident endangered species. In addition, EPA expects the regulation to result in the increased propagation and health of fish and other organisms, maintaining fisheries for both commercial and recreational purposes. Recreational activities such as boating, water skiing, and swimming would also be enhanced by water quality improvements. Finally, the Agency expects that the regulation would augment nonuse value (e.g., option, existence, and bequest value) of the water resources affected by industrial laundries discharges.

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[14]Centers for Disease Control, 1991. *Preventing Lead Poisoning in Young Children.* U.S. Department of Health and Human Services, October.

It is frequently quite difficult, however, to quantify and attach economic values to ecological benefits. The difficulty results from imperfect understanding of the relationship between changes in effluent discharges and the benefit events. In addition, it is difficult to attach monetary values to these benefit events because they often do not occur in markets in which prices or costs are readily observed. As such, ecological benefits may be loosely classified as nonmarket benefits. This classification can be further divided into nonmarket *use* benefits and nonmarket *nonuse* benefits.

Nonmarket use benefits stem from improvements in ecosystems and habitats, which in turn lead to enhanced human use and enjoyment of these areas. For example, reduced discharges can lead to increased recreational use and enjoyment of affected waterways in such activities as fishing, swimming, boating, hunting or bird watching. In some cases, it might be possible to quantify and attach partial economic values to ecological benefit events on the basis of market values (e.g., an increase in tourism or boat rentals associated with improved recreational fishing opportunities); in this case, these benefit events might better be classified as economic productivity-related events, which are discussed below. Such events, however, often cannot be fully valued using information from economic markets. In this case, they are more appropriately classified as nonmarket use benefits since economic markets will only capture related expenditures made by recreationists such as food and lodging and will not capture the value placed on the experience itself.

Nonmarket nonuse benefits are not associated with current use of the affected ecosystem or habitat but arise rather from (1) the *realization* of the improvement in the affected ecosystem or habitat resulting from reduced effluent discharges and (2) the value that individuals place on the *potential for use* sometime in the future. Nonmarket nonuse benefits might also be manifested by other valuation mechanisms, such as cultural valuation, philanthropy, and bequest valuation. It is often extremely difficult to quantify the relationship between changes in discharges and the improvements in societal well-being associated with such valuation mechanisms. That these valuation mechanisms exist, however, is indisputable, as evidenced, for example, by society's willingness to contribute to organizations whose mission is to purchase and preserve lands or habitats for the sole purpose of averting development.

Economic Productivity Benefits

EPA also expects the proposed regulation to benefit POTWs receiving effluent discharges from industrial laundries facilities. Large quantities or high concentrations of some pollutants in industrial laundries discharges might reduce POTW efficiency or capacity, for example, by inhibiting microbial degradation. Removal of pollutants that inhibit degradation might lead to less expensive POTW operation. In addition, toxic pollutants present in the effluent discharges might pass through a POTW and adversely affect receiving water quality or contaminate sewage sludge generated during primary or secondary wastewater treatment. POTWs would also benefit from the proposed regulation by being able to dispose of sewage sludge using less expensive and more environmentally beneficial methods. For example, higher-quality sewage sludge might be applied to agricultural land rather than having to be incinerated or sent to landfills.

Other economic productivity gains that could possibly result from reduced industrial laundries pollutant discharges (but that were not monetized in this analysis) include reduced treatment costs for irrigation water, industrial cooling water, and municipal drinking water supplies. In addition, economic productivity benefits could possibly accrue from improved tourism opportunities in areas that are affected by effluent discharges. Finally, ecological benefits such as improved species survival would most likely be translated into economic productivity benefits through increases in commercially caught fish populations and yield.

10.4.1.3 Methods for Valuing Benefit Events

Some expected benefits would manifest in economic markets through a change in prices, costs, or quantities of market-valued activities that are affected by industrial laundries discharges. When available, such market values of benefit events were used to estimate benefits. For example, improved sewage sludge quality resulting from the IL Standards would translate into an observable reduction in sewage sludge disposal costs for some POTWs. However, in other cases, benefits involve activities or valuation mechanisms that either do not involve economic markets or involve them only indirectly. Estimation techniques that were used to value such benefits in the following sections are described briefly below:

- *Wage-Risk Approach.* The wage-risk approach uses regression estimates of the wage premium associated with greater risks of death on the job to estimate the amount that persons are willing to pay to avoid death. Benefit values based on this approach are used in part as the basis for valuation of reduced cancer cases due to fish consumption in Section 10.4.2.

- *Travel Cost Method.* The travel cost method (TCM) uses information on the costs that people incur in traveling to and using a particular site to estimate a demand curve for that site and the consumer surplus associated with the use of the site. Benefit values based on this approach are used to value recreational fishing benefits in Section 10.4.3.

- *Contingent Valuation.* In the contingent valuation (CV) method, surveys are conducted to elicit individuals' willingness-to-pay for a particular good, such as a fishery, or clean water. Values from both the CV approach and the wage-risk approach underlie the estimated value of avoided death that is used to monetize reduced cancer cases from consumption of contaminated fish (Section 10.4.2). In addition, the analysis of recreational fishing benefits in Section 10.4.3 uses a baseline value of the fishery that is derived from CV analysis. Finally, nonuse value in Section 10.4.3 is estimated based on the ratio of nonuse to use value derived from 31 CV studies published since 1981.[15]

10.4.1.4 Linking the Regulation to Beneficial Outcomes

As indicated in Figure 10-1, the benefits of the proposed regulation would result from a chain of events including: 1) EPA publication of the regulation, 2) industry changes in production processes and/or treatment systems, 3) industry reductions in pollutant discharges, 4) changes in water quality, 5) changes in ecosystem attributes and sewage sludge quality, 6) changes in human responses (e.g., recreational angling), and 7) changes in human health and ecological risk.

The first two events reflect the institutional and technical aspects of implementing the regulation. The cost-benefit analysis in this EA begins with the third event by evaluating the physical effects of the regulation such as the changes in the pollutant content of effluent discharges and the costs associated with such changes. Next, in Events 4 and 5, the changes in pollutant discharges translate into improvements in water and sewage sludge quality and, in turn, into increased diversity of aquatic species and size of species populations. Events 6 connects improvements to recreational fisheries with enhanced enjoyment by recreational anglers. Finally,

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[15] Bergstrom, J.C., 1993. *Benefits and Costs Transfer in Natural Resource Planning.* Sixth Interim Report. Athens, GA. University of Georgia, Department of Agriculture and Applied Economics.

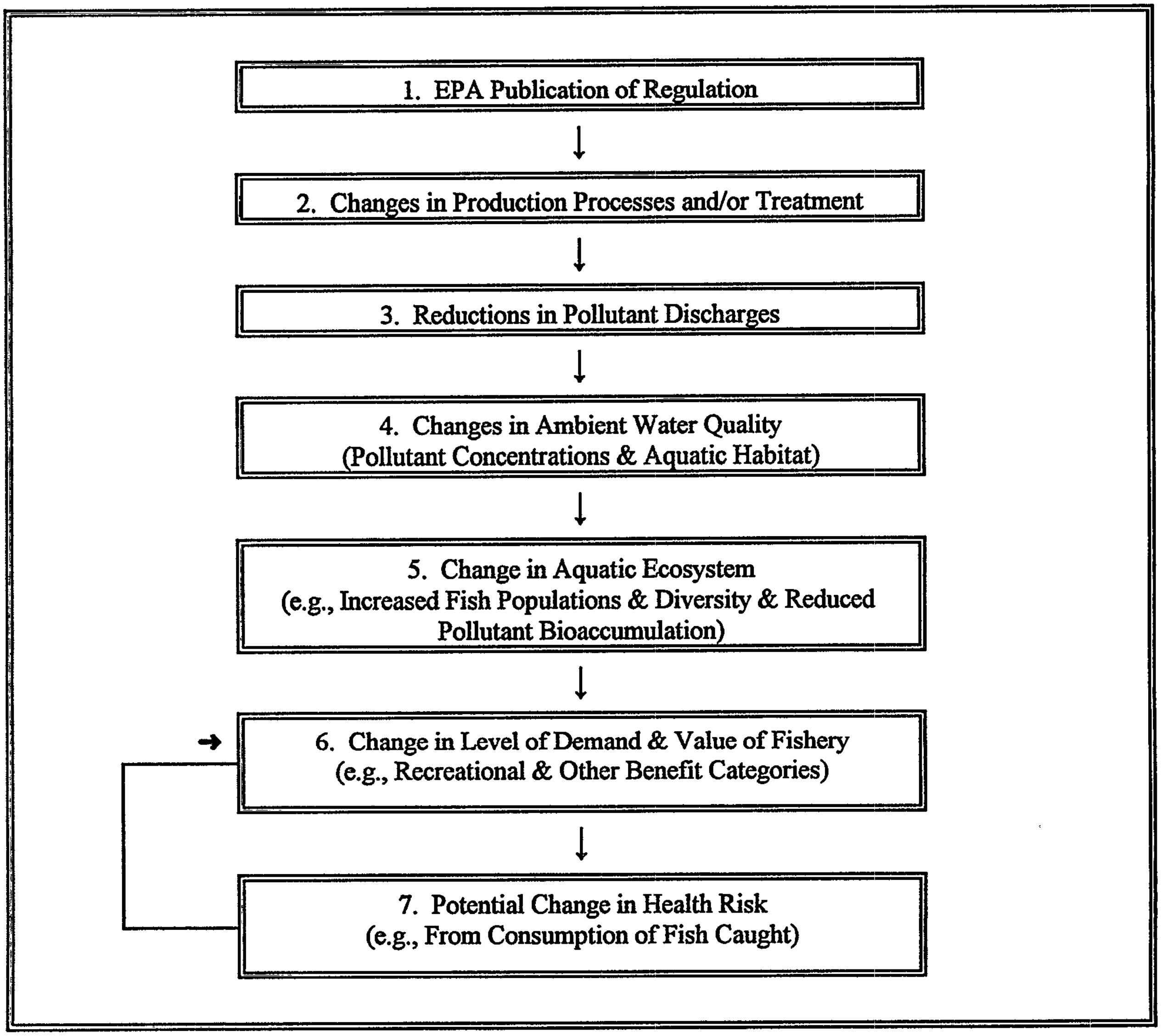

Figure 10-1. Chain of events in a benefits analysis—example: water-related benefits.

Event 7 links improved water quality with the value of reduced risk to human health. These connections are the basis of the benefits analysis presented in the following sections.

10.4.2 Human Health Benefits

EPA expects that the proposed IL Standards would yield human health benefits by reducing discharges of the identified pollutants to waterways from which fish are taken for human consumption. This section reviews the methodology and findings of benefits estimation for two categories of expected human health benefits: reduction in cancer cases from consumption of chemically contaminated fish tissue, and reduced frequency of pollutant concentrations in excess of health-based AWQC limits. Health-related measures were estimated for the baseline, for the proposed rule (CP option), and for options considered (COMBO and DAF). *The reductions in the occurrence of these health-related measures (e.g., number of annual cancer cases) from baseline to postcompliance are the estimated health benefits of the proposed regulation.*

10.4.2.1 Reduced Incidence of Cancer from Consumption of Fish Taken from Waterways Affected by Industrial Laundries Discharges

In this section, EPA first summarizes the methodology for valuing the reduction in cancer incidence attributable to the proposed regulation and then presents the estimated monetary value of these health effects. The analysis of reduced annual occurrence of cancer in exposed populations via the fish consumption pathway involves four analytic steps: 1) estimating, from reduced pollutant contamination of fish, the reduced lifetime risk of developing cancer for an individual within the exposed population; 2) estimating the size of the population that would be expected to benefit from reduced pollutant contamination of fish; 3) calculating the annual change in the number of cancer events in the exposed population; and 4) valuing mortality effects. In the concluding part of this section, EPA discusses the estimated benefits of the reduction in annual cancer incidence from each regulatory option.

Estimating Cancer Risk from Consumption of Chemically Contaminated Fish

The estimated marginal risk[16] to an individual of developing cancer is based on the quantity of carcinogenic chemicals that industrial laundries facilities discharge to waterways, the bioaccumulation of discharged chemicals in fish tissue, the cancer-related effects of the discharged chemicals, and the rate of consumption of chemically contaminated fish. For each sampled industrial laundries facility and the waterway to which it discharges, EPA calculated baseline and postcompliance marginal cancer risk for two population classes that differ based on fish consumption rates: recreational anglers and subsistence anglers.

EPA identified eight industrial laundries pollutants that are classified as known or probable human carcinogens and for which a quantitative relationship between ingestion rate and annual probability of developing cancer has been estimated: arsenic, beryllium, bis(2-ethylhexyl-phthalate), 1,2-diphenylhydrazine, chloroform, isophorone, methylene chloride, and tetrachloroethene. For these eight chemicals, EPA calculated the pollutant concentrations in each waterway to which industrial laundry facilities discharge. To estimate pollutant concentrations in the affected waterways, EPA used a model of in-waterway concentration dilution that accounts for the dilution characteristics of different waterbody types (i.e., streams, estuaries, and lakes). The model does not account for other fate processes such as chemical degradation or photolysis. In addition, the analysis considered only the discharge site and did not estimate concentration effects below the initial point of discharge. The methods for calculating pollutant concentrations are described in Section 3.2 of the WQBA.[17]

The pollutants analyzed and their cancer potency factors—that is, the upper bound probability of cancer per milligram of chemical ingested per day per kilogram of body mass over a lifetime—are presented in Exhibit B-2 in Appendix B of the WQBA. Risk values were estimated separately for subsistence fishing households and recreational fishing households. The risks differ in the assumed consumption rates and exposure durations of the respective populations. Persons living in subsistence fishing households were

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[16] The risk value is referred to as the *marginal* risk because it is the incremental lifetime probability for an individual of developing cancer above and beyond the baseline probability posed by all other extant factors that contribute to a risk of developing cancer.

[17] The specific formulation for calculating the risk to an individual from consumption of contaminated fish tissue is provided in Section 2.2.2 of the WQBA.

assumed to consume an average of 140 grams per day (0.140 kg/day) of fish over 70 years of exposure. The risks to recreational fishing households were estimated over two life segments. Specifically, persons living in recreational household were assumed to consume an average of 30 grams of fish per day (0.030 kg/day) over a 30-year period, and 6.5 grams per day (0.0065 kg/day) over a 40-year period. The total lifetime marginal risk for these households is calculated by summing the risks for both periods.[18] To estimate the *annual* increased risk of cancer in recreational and subsistence anglers and their families, the lifetime risk values were then divided by 70 (an estimate of lifetime). The marginal annual risk of developing cancer from exposure to more than one pollutant was assumed to be the sum of the marginal effects from each pollutant.

Estimating the Population Expected to Benefit from Reduced Contamination of Fish

The population exposed to chemically contaminated fish and thus expected to benefit from reduced discharges includes recreational and subsistence anglers who fish affected reaches, as well as members of such anglers' households.[19] A "reach" is defined as a specific length of river, lake shoreline, or marine coastline, and an "industrial laundries reach" is a reach to which an industrial laundries facility discharges.[20] The geographic area from which anglers would travel to fish a reach is assumed to include only those counties that abut a given reach.[21] Estimating the number of persons fishing a reach involved the following steps:

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[18] See Appendix D of the WQBA. EPA also investigated the impact of an alternative assumption for the fish consumption rate. Result were similar to those presented here (see Appendix D of the WQBA).

[19] The exposed, and thus potentially benefitting, population would also include a category of "all other individuals" who consume freshwater and estuarine fish and shellfish (e.g., commercially caught species). Although these individuals are expected to have a much lower average daily exposure rate, they nevertheless would likely receive some benefit from reduced exposure to pollutants through fish consumption. This analysis omits this consumption category because it is not possible to reliably quantify the associated benefits.

[20] All industrial laundries facilities considered in this analysis discharge to POTWs, which in turn discharge to waterways. The relevant industrial laundries reach for this analysis is therefore the reach to which the receiving POTW discharges. All analyses of in-waterway concentrations and related impacts are post-POTW and reflect the treatment of pollutants at the POTW.

[21] This assumption is based on U.S. Department of the Interior's finding that 65 percent of anglers travel less than 50 miles to fish. U.S. Department of the Interior, 1993. *1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.*

- *Estimating the Licensed Fishing Population in Counties Abutting Industrial Laundries Reaches.* To estimate the number of anglers fishing an industrial laundries reach, EPA first estimated the number of fishing licenses sold in the counties abutting the reach. This number was assumed to approximate the number of anglers residing in the abutting counties. Sample industrial laundries facilities are located in 41 states. Due to time and resource constraints, it was not possible to collect fishing license data at the county level for all 41 states. Thus, EPA used state-level data to estimate the number of fishing licenses per county. Total state licenses were apportioned to counties based on the ratio of total population in the county abutting a discharge reach to total state population. Where an industrial laundries reach spans more than one county, fishing licenses were summed across all counties abutting the discharge reach. Where a reach lies in more than one state, EPA separately calculated the number of licenses for the abutting county(ies) in each state based on the fishing license and county population data for the respective states.

- *Estimating the Population of Subsistence Anglers in Counties Abutting Industrial Laundries Reaches.* Although fishing licenses may be sold to subsistence anglers, many such anglers do not purchase fishing licenses. Thus, the magnitude of subsistence fishing is not generally known *and will generally be additional to the fishing activity estimated for licensed anglers*. For this analysis, EPA assumed that subsistence anglers would constitute an *additional* 5 percent of the licensed fishing population.[22]

- *Estimating the Fraction of the Fishing Population that Fish an Industrial Laundries Reach.* EPA assumed that fishing activity among anglers residing within counties abutting a discharge reach is distributed evenly among all reach miles within those counties. Thus, the number of anglers who fish an industrial laundries reach was estimated by computing the length of the reach as a percentage of total reach miles within corresponding counties and multiplying the estimated ratio by the total fishing population in counties abutting the reach.

- *Adjusting for Fish Advisories*. For industrial laundries reaches where fish advisories are in place, EPA assumed that some proportion of anglers would adhere to the advisory and not fish those reaches. Based on the existing studies, EPA assumed that recreational fishing would be 20 percent less on reaches subject to an advisory.[23] EPA further assumed that fish advisories do not affect fishing participation by subsistence anglers; thus, no adjustment was made for this population.

- *Including Family Members in the Exposed Population Estimates.* For each industrial laundries reach, EPA multiplied the estimated numbers of recreational and subsistence anglers by the corresponding size of the average household in each state in 1993, based on

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[22] It is important to estimate recreational and subsistence populations separately because fish consumption rates for subsistence anglers are considerably higher than those for recreational anglers.

[23] For a detailed discussion of estimation of the fraction of anglers adhering to the fish advisories, see U.S. EPA, 1995. *Op. cit.*

Current Population Reports.[24] These calculations yielded the household populations of recreational and subsistence anglers who are estimated to consume fish from the reach.

Calculating the Change in the Number of Cancer Events in the Exposed Population

EPA calculated the cancer cases associated with the pollutant discharges from each facility by multiplying the annual marginal cancer risk value for the two population classes (i.e., recreational angler households and subsistence angler households) by the estimated size for each population class. Summing the values for the recreational and subsistence fishing household classes yielded the total number of cancer cases associated with the sample facility discharges. Because these cancer event values apply to *sample* facilities, EPA extrapolated the sample results to the total industrial laundries population by multiplying the result obtained for each sample facility by its sample weight and summing the results. These values were calculated for the baseline and postcompliance cases. The *difference* is the number of cancer cases estimated to be avoided annually.

Valuing Mortality Effects

In valuing improvements in human health resulting from the proposed regulation, EPA relied on estimates of society's willingness to pay (WTP) to avoid the risk of cancer-related premature mortality. Because cancer is often a fatal disease, it is likely to be perceived by individuals as a mortal event. Thus, avoided cancer cases are valued on the basis of avoided *mortality*. To value mortality, EPA used a range of values recommended by an EPA, Office of Policy Analysis (OPA), review of studies quantifying individuals' willingness-to-pay.[25,26] OPA recommended a range of $1.6 to $8.5 million (1986 dollars) for valuing an avoided event of premature mortality or a statistical life saved. EPA adjusted the figures recommended in the

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[24] U.S. Bureau of the Census, 1993. *Statistical Abstract of the U.S.*

[25] Fisher, A., L. Chestnut, and D. Violette, 1989. "The value of reducing risks of death: A note on new evidence." *Journal of Policy Analysis and Management.* Vol. 8, No. 1.

[26] Violette, D., and L. Chestnut, 1986. *Valuing Risks: New Information on the Willingness to Pay for Changes in Fatal Risks.* Contract #68-01-7047. Report to U.S. EPA, Washington, DC.

OPA study to 1993, using the change in the Employment Cost Index of Total Compensation for All Civilian Workers from 1986 to 1993 (34 percent).[27] This yields a range of $2.1 to $11.4 million.

Reduced Incidence of Cancer from Fish Consumption

As described in the preceding discussion of methodology, EPA estimated the expected reduction in cancer cases resulting from consumption of chemically contaminated fish taken from waterways affected by industrial laundries facility discharges. Table 10-9 indicates the number of cancer cases that would be avoided by the IL Standards. For combined recreational and subsistence angler populations, EPA estimated that the CP option would eliminate approximately 0.040 cancer cases per year from a baseline value of about 0.133 cases, representing a reduction of about 30 percent. As shown in Table 10-9, the DAF and COMBO options would eliminate approximately 0.038 cancer cases per year, representing a reduction of about 28 percent.

From estimates of society's willingness to pay to avoid the risk of cancer-related premature mortality, EPA estimated a monetary value of benefits to society from avoided cancer cases for the fish consumption pathway. As summarized in Table 10-9, annual monetary benefits from reduced cancer risk for the proposed regulation are estimated at $0.086 to $0.456 million per year. EPA estimates that COMBO and DAF would yield annual monetary benefits from avoided cancer cases ranging from $0.082 to $0.433 million.

10.4.2.2 Reduced Pollutant Concentrations Resulting from Industrial Laundries Discharges in Excess of Human Health AWQCs

As another approach for quantifying reductions in health risk, EPA estimated the extent to which reduced industrial laundries discharges would decrease the occurrence of pollutant concentrations in affected waterways that exceed human health-based AWQCs (AWQC exceedences). AWQCs are set at levels to

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[27] U.S. Bureau of the Census, 1993. *Op cit.* The adjustment in the WTP values is based on the change in total compensation because the original estimates of the value of a statistical life saved are based on comparative wage-risk studies.

Table 10-9

Estimated Annual Avoided Cancer Cases and Value of Benefits for Industrial Laundry Regulatory Options

Regulatory Options	Fish Consumption	
	Avoided Cancer Cases[a]	Value of Benefit[b] ($ million)
CP	0.040	$0.086 - $0.456
DAF	0.038	$0.082 - $0.433
COMBO	0.038	$0.082 - $0.433

[a] Eight industrial laundry pollutants are classified as known or probable human carcinogens: arsenic, beryllium, bis(2-ethylhexyl-phthalate), 1,2-diphenylhydrazine, chloroform, isophorone, methylene chloride and tetrachloroethene.

[B]Estimated value of avoided cancer case ($1993): $2.14 million to $11.39 million.

Source: U.S. EPA., WQBA.

protect human health through 1) ingestion of aquatic organisms and 2) ingestion of water *and* aquatic organisms.[28] They reflect both *cancer* and *noncancer* health risks. Accordingly, reducing AWQC exceedences should reduce risk. The measure of reduced risk is the number of industrial laundries reaches in which AWQC exceedences are eliminated by the proposed regulation. Because this measure of benefits is independent of the exposed population that might benefit from reduced discharges, the measure should be viewed as an indirect indicator of reduced risk to human health.[29]

To assess whether the proposed regulation could be expected to eliminate human health-based AWQC exceedences, EPA estimated the baseline concentrations of all industrial laundries pollutants for each industrial laundries reach and compared them with human health-based AWQCs for the proposed option, CP, as well as COMBO and DAF. Human health-based AWQCs for consumption of water or organisms were available for 40 industrial laundry pollutants (see Exhibit B-1 in Appendix B of the WQBA). Of these 40 pollutants, 7 are classified as both human carcinogens and noncancer toxicants, 1 chemical is designated as a human carcinogen only, and 32 are identified as human noncancer toxicants.[30] In addition, human health-based AWQCs for consumption of organisms only were available for 35 industrial laundry pollutants (see Exhibit B-1 in Appendix B of the WQBA). An industrial laundries reach in which the concentration of a pollutant exceeded an AWQC value was identified as a human health AWQC exceedence reach. Reaches with AWQC exceedences in the baseline but not postcompliance were estimated to have improved as a result of the IL Standards. Although not explicitly accounted for in this analysis, human health risk reductions are also likely to occur wherever in-waterway concentrations are reduced, regardless of whether they are reduced to levels below human health-based AWQCs.

At baseline discharge levels, in-waterway concentrations of two industrial laundries pollutants that are identified as both human carcinogens and noncancer toxicants—bis(2-ethylhexyl)phthalate and tetrachloroethene—are estimated to exceed human health-based AWQC limits in nine reaches (see

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[28] Aquatic organisms include fish and shellfish.

[29] The following section uses this same information *in part* as a direct indicator of improved water quality.

[30] Chemicals identified as both human carcinogens and noncancer toxicants include: arsenic, beryllium, bis(2-ethylhexyl-phthalate), chloroform, isophorone, methylene chloride, and tetrachloroethene.

Table 10-10).[31] EPA estimated that the proposed regulation would eliminate AWQC exceedences for consumption of water or organisms in seven reaches.[32] The COMBO and DAF options would also eliminate human health-based AWQC exceedences for consumption of water or organisms in seven reaches. None of the human health-based AWQC limits for consumption of *organisms only* were exceeded in the baseline.

10.4.3 Assessing the Ecological Benefits of the IL Standards

This section analyzes ecological benefits from reduced effluent discharges to the nation's waterways as a result of the proposed IL Standards. EPA assessed ecological benefits in terms of reduced occurrence of pollutant concentrations that exceed chronic and acute toxic effect levels for aquatic species. The reduced occurrence of concentrations in excess of AWQC limits provides a quantitative measure of the improvement in aquatic species habitat expected to result from the proposed regulation. For this analysis, EPA attached a monetary value to the anticipated increased value of recreational fishing due to the elimination of AWQC exceedences.

This estimated benefit value is only a limited measure of the value to society of improvements in aquatic habitats because it ignores other recreational effects and valuation mechanisms that are separate from recreation. In addition, the valuation of benefits based on enhanced recreational fishing experience might partially overlap with the valuation of benefits from reduced risk to human health from fish consumption.[33]

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[31] EPA estimated the occurrence of pollutant concentrations in excess of AWQCs on the basis of sample facility data. These findings were extrapolated to national estimates using facility sample weights. For reaches to which only one industrial laundries sample facility discharges, the extrapolation is based simply on that facility sample weight. However, for reaches to which more than one industrial laundries sample facility discharges, an alternative method was used to scale sample facility results to national estimates (see Appendix A in the WQBA).

[32] The total number of benefitting reaches does not equal the difference in the number of reaches adversely affected by industrial laundries discharges in the baseline and postcompliance due to rounding.

[33] Potential overlap in valuation of enhanced recreational fishing opportunities and reduced cancer risk via the fish consumption pathway is discussed in detail in Section 10.4.4, Uncertainty and Limitations of the Benefit Estimation Methodology.

Table 10-10

Industrial Laundry Discharge Reaches with Pollutant Concentrations Exceeding Human Health-Based AWQC Limits and Reductions Achieved by the Industrial Laundry Regulatory Options

	Number of Reaches with Concentrations Exceeding Health-Based AWQCs[a]	
Regulatory Options	**Human Health, Water and Aquatic Organisms[b]**	**Percent Reduction**
Baseline	9	
CP	2	77
COMBO	2	77
DAF	2	77

[a] Pollutants exceeding human health-based AWQS values under the baseline: bis (2-ethylhexyl)phthalate and tetrachloroethene. These pollutants are classified as both human carcinogents and noncancer toxicants.

[b] Aquatic organisms include fish and shellfish.

Source: U.S. EPA, WQBA.

10.4.3.1 Methodology for Assessing Ecological Benefits

The methodology for assessing the ecological benefits of the IL Standards involves two elements:

1) Identifying industrial laundries discharge reaches for which the proposed regulation is expected to eliminate AWQC exceedences for aquatic species; and

2) Attaching a monetary value to the elimination of AWQC exceedences.

Identifying Discharge Reaches in Which AWQC Exceedences for Aquatic Life AWQCs Would Be Eliminated

EPA evaluated potential impacts to aquatic life by estimating in-waterway concentrations of pollutants discharged by industrial laundries facilities and comparing those concentrations to AWQC limits for protection of aquatic species. EPA interpreted pollutant concentrations in excess of these limits to mean significant detriment to the aquatic species habitat. Thus, eliminating AWQC exceedences as a result of the IL Standards would mean a significant improvement in the habitat of aquatic species and thus provides a quantitative measure of ecological benefit.

EPA estimated in-waterway concentrations for all industrial laundries pollutants for which aquatic life exposure criteria are available. Freshwater chronic and acute AWQC for protection of aquatic species were available for 64 and 58 pollutants, respectively, and salt water chronic and acute AWQC limits were available for 12 and 20 pollutants, respectively (see Exhibit B-1 in Appendix B of the WQBA).[34] EPA calculated in-waterway concentrations for acute and chronic exposure and compared the values to AWQC limits. A chronic value represents the average allowable concentration of a toxic pollutant over a 4-day period at which a diverse genera of aquatic organisms and their uses should not be unacceptably affected, provided that these levels are not exceeded more than once every 3 years. The acute value represents a maximum allowable 1-hour average concentration of a pollutant at any time that protects aquatic life from lethality.

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[34] Sources for AWQC include: U.S. EPA, 1980, 1985, and 1987. *Ambient Water Quality Criteria Documents,* Office of Water, Washington, DC (EPA 440/5-80 series and EPA 440/5-85 and 87 with any *Federal Register Notices* series) along with proposed criteria or criteria corrections; and U.S. EPA, undated. *Assessment Tools for the Evaluation of Risk (ASTER) Data Base.* Duluth, MN: Environmental Research Laboratory, U.S. EPA.

To estimate the in-waterway concentrations resulting from industrial laundries facility discharges, EPA used the same mixing and dilution methods as outlined in Section 3.2 of the WQBA. For baseline discharge values, EPA identified the industrial laundries discharge reaches in which concentrations of one or more pollutants were estimated to exceed AWQC limits for aquatic species due to industrial laundries discharge alone. If concentrations of all pollutants fell below AWQC limits as a result of the proposed regulation, then aquatic species habitat conditions on that discharge reach would be likely to improve significantly as a result of the proposed rule.

Valuing the Elimination of Pollutant Concentrations in Excess of AWQC Limits

The reduced occurrence of pollutant concentrations in excess of AWQC limits is expected to generate benefits to recreational anglers by increasing the quality of their experience and/or the number of days they subsequently choose to fish an industrial laundries reach. Anglers might place a significantly higher value on a contaminant-free fishery than a fishery with some level of contamination.[35] The estimated incremental benefit values associated with freeing the fishery of contaminants range from 11.1 percent to 31.3 percent of the value of the fishery under current conditions.[36]

EPA assumed that eliminating concentrations in excess of AWQC limits for aquatic species and human health could be interpreted as approximately equivalent to achieving a contaminant-free fishery.[37] Accordingly, EPA estimated an increase in the value of recreational fishing for industrial laundries reaches in which all AWQC exceedences would be eliminated as a result of the proposed IL Standards. EPA used site-specific information on fishing activity to estimate the baseline value of the resource to which the estimated percentage increase in value is applied.

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[35] Lyke, A., 1993. *Discrete Choice Models to Value Changes in Environmental Quality: A Great Lakes Case Study.* Thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy (Agricultural Economics) at the University of Wisconsin-Madison.

[36] *Ibid.*

[37] The analysis of reduced exceedences of human health-based AWQCs was discussed in the previous section.

EPA first estimated the baseline recreational fishery value of the reaches on the basis of estimated annual person-days of fishing per reach and estimated values per person-day of fishing. To estimate annual person-days of fishing per reach, EPA estimated the number of licensed anglers in counties bordering industrial laundries reaches using the same methodology as described in Section 10.4.2.1. The number of anglers was multiplied by U.S. Fish and Wildlife (FWS) estimates of the average number of fishing days per angler in each state to estimate the total number of fishing days for each industrial laundries reach. The baseline value for each reach was then calculated by multiplying the estimated total number of fishing days by an estimate of the net benefit that anglers receive from a day of fishing, where net benefit represents the total value of the fishing day exclusive of any fishing-related costs (license fee, travel costs, bait, etc.) incurred by the angler. A range of median net benefit values for warm water and cold water fishing days of $28.6 and $36.2 (1993 dollars), respectively, was used in this analysis.[38] Weighting by facility weights and summing over all benefitting reaches provided a total baseline recreational fishing value of industrial laundries reaches that are expected to benefit by elimination of pollutant concentrations in excess of AWQC limits.

To estimate the increase in value resulting from elimination of AWQC exceedences, the baseline value for benefitting reaches was multiplied by the incremental gain in value associated with achievement of the contaminant-free condition.

10.4.3.2 Estimated Aquatic Life and Recreational Benefits

Ecological benefits were quantified by estimating the reduction in the number of industrial laundries reaches with AWQC exceedences for aquatic species. As shown in Table 10-11, baseline pollutant concentrations would exceed chronic exposure criteria for protection of aquatic species on 78 reaches. None of the *acute* exposure AWQC limits for aquatic life were exceeded in the baseline. The proposed regulation would eliminate chronic AWQC exceedences for aquatic life in 66 reaches for which baseline discharges are

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[38] Walsh, R., D. Johnson, and J. McKean, 1990. "Nonmarket values from two decades of research on recreational demand." *Advances in Applied Micro-Economics.* Vol. 5. The original values per fishing day were brought to the base year for the industrial laundry analysis based on the change in the Consumer Price Index for all urban customers (CPI-U), as published by the Bureau of Labor Statistics (U.S. Bureau of the Census, 1984. *Statistical Abstract of the United States, 1994.* Washington, DC.: Bureau of Labor Statistics).

Table 10-11

Estimated Industrial Laundry Discharge Reaches with Industrial Laundry Pollutant Concentrations in Excess of AWQC Limits for Protection of Aquatic Species or Human Health

Regulatory Status	Reaches with Concentrations Exceeding			Number of Reaches with Concentrations Exceeding AWQC Limits
	AWQC Acute Exposure Limits for Aquatic Species	AWQC Chronic Exposure Limits for Aquatic Species	AWQC Limits for Human Health	
Baseline	0	78	9	78
CP	0	12	2	12
COMBO	0	12	2	12
DAF	0	12	2	12

Note: In the baseline, the total number of reaches with concentrations exceeding AWQC limits does not equal the sum of the numbers in the separate analysis categories because some reaches were estimated to have concentrations in excess of AWQC limits for more than one analysis category.

Source: U.S. EPA, WQBA.

estimated to cause AWQC exceedences. The COMBO and DAF options would eliminate chronic AWQC exceedences in 66 reaches.

Table 10-11 also summarizes the number of reaches in which baseline concentrations are estimated to exceed AWQC limits for aquatic species and human health and the estimated number of reaches freed of contaminants as a result of proposed rule. Baseline pollutant concentrations would exceed a health-based AWQC limit on nine reaches. The proposed regulation would eliminate AWQC exceedences on seven of these discharge reaches. Note that the reaches with human health AWQC exceedences are a subset of the reaches with aquatic life AWQC exceedences.

The combined analysis over all AWQC limit categories indicated that the industrial laundry pollutant concentrations would exceed AWQC limits on 78 reaches as the result of baseline industrial laundry discharges. Options CP, COMBO and DAF would eliminate the occurrence of concentrations in excess of AWQC limits on 66 discharge reaches, leaving only 12 reaches with concentrations for one or more pollutant that exceed AWQC limits. EPA estimated that the monetary value of improved recreational fishing opportunity for the 66 discharge reaches on which AWQC exceedences are eliminated ranges from $1.70 to $6.08 million annually for the proposed option.

10.4.3.3 Nonuse Benefits

Individuals who never visit or otherwise use a natural resource might nevertheless be affected by changes in its status or quality. Empirical estimates indicate that such "nonuse value" can be substantial for some resources.[39,40,41] Most studies find nonuse values to exceed use values. For example, based on a review

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[39] Harpman, D.A., M.P. Welsh, and R.C. Bishop, 1994. "Nonuse economic value: Emerging policy analysis tool." *Rivers*. Vol. 4, No. 4.

[40] Fisher, A., and R. Raucher, 1984. "Intrinsic benefits of improved water quality: Conceptual and empirical perspectives." In V. Kerry Smith and Anne White, Editors. *Advances in Applied Microeconomics.* Vol. 3., pp. 37-66. Greenwich, CT: JAI Press.

[41] Bergstrom, J.C., 1993. *Benefits and Costs Transfer in Natural Resource Planning*. Sixth Interim Report. Athens, GA: University of Georgia, Department of Agricultural and Applied Economics.

(continued...)

of recent contingent valuation studies in which both use and nonuse values were estimated, Bergstrom estimates the relative magnitude of nonuse value to use value by estimating the ratio of the former to the latter. The 34 ratios estimated by Bergstrom range from 0.1 to 10, with the median ratio of 1.92.[42] Because nonuse value is a sizable component of the total economic value of water resources, EPA estimated the change in nonuse values in proportion to recreational fishing benefits. For this analysis, EPA conservatively estimated that nonuse benefits compose one-half of recreational fishing benefits.[43] This assumption yields nonuse benefits attributable to the proposed IL Standards ranging from $0.85 to $3.04 million per year.

10.4.4 POTW Benefits

Reduced effluent discharges from the industrial laundries industry will yield economic productivity benefits by reducing production costs or increasing the value of output in industries whose performance is affected by regulated industry discharges. EPA estimated productivity benefits for 1) reduced interference of POTW operations and 2) reduced pollutant contamination of sewage sludge at POTWs receiving discharges from industrial laundries facilities. Another possible benefit of the proposed regulation (which was not analyzed in this analysis) is that some POTWs that would otherwise have incurred costs to develop individual discharge limits for industrial laundries will no longer have to do so.

10.4.4.1 Reduced Interference with POTW Operations

High levels of some industrial laundries pollutants, such as metals, chlorobenzene, halogenated aliphatics, or oil and grease, can kill bacteria that are required for the wastewater treatment process.[44] POTWs affected by such "inhibition problems" might incur extra labor and materials costs to maintain system

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[41] (...continued)

[42] *Ibid.*

[43] Previously, EPA used this method for estimating nonuse benefits attributable to Great Lakes Water Quality Guidance. For more details, please refer to Silverman, W., 1990. *Michigan's Sport Fish Consumption Advisory: A Study in Risk Communication.* Thesis submitted in partial fulfillment of the requirements for the degree of Master of Science (Natural Resources) at the University of Michigan, May.

[44] U.S. EPA, 1987. *Guidance for Preventing Interference with POTW Operations.*

operations. As a partial measure of the economic benefits resulting from the proposed regulation, EPA estimated the extent to which reduced industrial laundries discharges will decrease pollutant concentrations below POTW pollutant inhibition values. The measure of reduced interference of POTW processes is the number of POTWs to which industrial laundries facilities discharge, in which all instances of pollutant concentrations from industrial laundries facility discharges exceeding POTW inhibition values are estimated to be eliminated as a result of the proposed rule.

To assess whether the proposed regulation could be expected to eliminate influent concentrations in excess of POTW inhibition values, EPA estimated the baseline influent concentrations of all industrial laundries pollutants for each POTW to which one or more industrial laundries facilities discharge. For each POTW receiving discharges from industrial laundries facilities, the influent concentrations were estimated based on annual pollutant loadings from the industrial laundries facility, number of facility's operating days per year, and the gross influent volume to a POTW. The baseline influent concentrations were compared with available inhibition levels (see Exhibit B-3 in Appendix B of the WQBA). POTWs in which influent concentrations of one or more pollutants were estimated to exceed an inhibition value were identified as having potential adverse effects on POTW operations, including inhibition of microbial degradation.

At current discharge levels, estimated POTW influent concentrations of lead exceed biological inhibition values at two POTWs associated with industrial laundries facilities. The analysis was repeated using the postcompliance discharge levels for CP, COMBO, and DAF. At the discharge levels for CP, COMBO, and DAF, EPA estimated that exceedences of influent concentrations in excess of the POTW inhibition value for lead are eliminated at both of the affected POTWs. POTWs estimated to have influent concentrations in excess of POTW inhibition limits in the baseline but not in the postcompliance case were assessed as having potential cost savings associated with maintenance required for rehabilitation of the affected POTW systems. However, EPA has not estimated a monetary value for these benefits.

EPA estimated the occurrence of influent concentrations in excess of POTW inhibition values on the basis of sample facility data. The findings from the sample facility analysis were extrapolated to national estimates using facility sample weights.

10.4.4.2 Estimating Shifts in Sewage Sludge Disposal Practices

As mentioned earlier, EPA expects that, as a result of regulation, sewage sludge for some POTWs will meet more stringent pollutant limits, which in turn will permit less expensive use or disposal of sewage sludge. This section first presents an overview of potential economic productivity benefits resulting from cleaner sewage sludge, then describes the methodology for estimating benefits to POTWs that are expected to improve their sewage sludge quality as a result of the proposed regulation, and, finally, concludes with the estimate of benefits from improved sewage sludge quality.

As required by law, POTWs must use environmentally sound practices in managing and disposing of this sewage sludge. Because the proposed IL Standards would require reductions in pollutant levels in wastewater, the POTWs that receive industrial laundries discharges are expected to generate sewage sludge with reduced pollutant concentrations. As a result, the POTWs should be able to use or dispose of the sewage sludge with reduced pollutant concentrations at lower cost. In some cases, POTWs might be able to dispose of the cleaner sewage sludge by using it in agricultural applications, which will generate additional agricultural productivity benefits. Several benefits are expected to result from reduced contamination of sewage sludge, including the following:

- *POTWs might be able to use or dispose of sewage sludge through less expensive means.*[45] The pollutant limits in 40 CFR Part 503 for sewage sludge land application, surface disposal, and incineration constrain a POTW's choice of sewage sludge use or disposal practice. Sewage sludge applied to agricultural land or placed on a surface disposal site is subject to stricter pollutant limits than sewage sludge used or disposed by other practices; however, these use or disposal practices are also generally less expensive than the alternatives. As a result of the proposed regulation, sewage sludge from some POTWs might meet more stringent limits, which, in turn, will permit less expensive use or disposal of the sewage sludge. In particular, sewage sludge might be able to be disposed of via land application, which in general will be substantially less costly than other use or disposal practices (e.g., incineration or landfilling).

- *Some sewage sludge that currently meets only Land Application Ceiling Concentration limits and pollutant loading rate limits (hereafter, Land Application-Low limits) would*

[45] The *Standards for the Use or Disposal of Sewage Sludge* (40 CFR Part 503) contain limits on the concentrations of pollutants in sewage sludge that is used or disposed. For each regulated sewage sludge use or disposal practice, the Part 503 Standard includes the following elements: General Requirements, Pollutant Limits; Management Practices; Operational Standards; and Frequency of Monitoring, Recordkeeping, and Reporting.

meet the more stringent Land Application Pollutant Concentration limits (hereafter, Land Application-High limits). Part 503 sets limits on pollutant concentrations at two levels: (1) Land Application-Low limits, which govern whether a sewage sludge can be applied to land at all; and (2) more stringent Land Application-High limits which define, in part, sewage sludge that is exempt from meeting certain record-keeping requirements. For sewage sludge meeting only the Land Application-Low limits, Part 503 contains pollutant loading rate limits, which limit the amount of sewage sludge and associated pollutant content that may be applied to a particular site. Entities that apply sewage sludge meeting Land Application-High pollutant limits would be exempt from meeting pollutant loading rate limits and, as a result, would face fewer recordkeeping requirements than users of sewage sludge that meets only Land Application-Low concentration and loading rate limits because there are no regulatory application rate limits.

- *By land applying sewage sludge, POTWs might avoid costly siting negotiations* regarding more contentious sewage sludge use or disposal practices, such as incinerating sewage sludge.

- *When used for beneficial land application, the sewage sludge produced by POTWs provides supplemental nitrogen, which enhances soil productivity.* Sewage sludge applied to agricultural land, golf courses, sod farms, forests, or residential gardens is a valuable source of nitrogen fertilizer.

- *Nonpoint source nitrogen contamination of water might be reduced if sewage sludge is used as a substitute for chemical fertilizers on agricultural land.* Compared to nitrogen in most chemical fertilizers, nitrogen in sewage sludge is relatively insoluble in water. The release of nitrogen from sewage sludge occurs largely through continuous microbial activity, resulting in greater plant uptake and less nitrogen runoff than from conventional chemical fertilizers.

- *The organic matter in land-applied sewage sludge can improve crop yields* by increasing the ability of soil to retain water.

- *Reduced sewage sludge concentrations of pollutants that are not currently subject to sewage sludge pollutant concentration limits can reduce human health and environmental risks.* Human health risks from exposure to these unregulated sewage sludge pollutants might occur from inhalation of particulates, dermal exposure, ingestion of food grown in sewage sludge-amended soils, ingestion of surface water containing sewage sludge runoff, ingestion of fish from surface water containing sewage sludge runoff, or ingestion of contaminated ground water.

- *Land application of sewage sludge satisfies an apparent public preference for this practice of sludge disposal,* apart from considerations of costs and risk.

This analysis assumes that POTWs choose the least expensive sewage sludge use or disposal practice for which their sewage sludge meets pollutant limits. Therefore, POTWs with sewage sludge pollutant concentrations that exceed the Land Application-High, Land Application-Low, or surface disposal pollutant limits in the baseline might be able to reduce sewage sludge use or disposal costs when industrial laundries facilities have complied with the proposed IL Standards. EPA estimated the number of POTWs and associated quantity of sewage sludge that will not meet Land Application-High pollutant limits, Land Application-Low pollutant limits, and surface disposal pollutant limits because of industrial laundries discharges under both the baseline and regulatory options. If, as a result of compliance with the proposed IL Standards, a POTW meets all pollutant limits for a less costly sewage sludge use or disposal method, that POTW is assumed to benefit from the reduced cost of that particular method.

Quantifying Benefits from Improved Sewage Sludge Quality

For each POTW receiving wastewater from a sample industrial laundries facility, EPA calculated the baseline and postcompliance sewage sludge pollutant concentrations based on the volume of all wastewater discharged to the POTW, treatment removal efficiency, and the sewage sludge generation factor.[46] Then EPA matched each POTW to one of the four sewage sludge use or disposal practice categories: land application, surface disposal, incineration, and co-disposal.[47] This analysis assumes the following order by ascending cost: Land Application-High, Land Application-Low, surface disposal, co-disposal, and incineration.

To determine which disposal practice was used under the baseline, EPA compared the sewage sludge pollutant concentrations calculated for each POTW with sewage sludge pollutant limits for surface disposal and land application published in the Part 503 Standards for the Use or Disposal of Sewage Sludge (see Exhibit B-3 in Appendix B of the WQBA). If, in the baseline, *any* sewage sludge pollutant concentration at a POTW exceeded the pollutant limit for a sewage sludge use or disposal practice, then EPA assumed that the POTW was restricted from that sewage sludge use or disposal practice.[48] The POTWs with restricted sewage sludge use or disposal options in the baseline are further analyzed in the postcompliance scenario. The

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[46] See Section 3.2.2 in the WQBA for a detailed description of the methodology for calculating sludge concentrations.

[47] For a detailed description of the composite sewage sludge use or disposal practice categories, see EPA, 1995. *Op. cit.*

[48] Each POTW exceeding surface disposal and Land Application-Low limits in the baseline is assumed to incinerate 32% and co-dispose 68% of sewage sludge.

Agency estimated that baseline concentrations of lead would fail to meet Land Application-High limits for sludge disposal at 10 POTWs (see Table 10-12). However, the baseline sewage sludge pollutant concentrations meet Land Application-Low limits at all of these 10 POTWs. All other POTWs were estimated to meet Land Application-High limits in the baseline.

EPA compared each POTW's postcompliance sewage sludge concentration with the sewage sludge pollutant limits for surface disposal and land application and used the same assumptions as discussed above to match each POTW to a sewage sludge use or disposal practice category. Then the postcompliance sewage sludge use or disposal practice was compared to the baseline sewage sludge use or disposal practice to determine whether the POTW shifts its disposal practice into a less costly category. If, as a result of compliance with the proposed IL Standards, a POTW upgrades its sewage sludge use or disposal practice, that POTW is assumed to benefit from the increase in sewage sludge use or disposal options.

EPA extrapolated the findings from the analysis of receiving POTWs affected by sample facility discharges to national estimates using facility sample weights. Where only one facility discharged to a POTW, the number of POTWs expected to benefit at the national level is simply the sample weight of the facility. However, for those POTWs to which more than one facility discharges, EPA used the differential sample-weighting technique to account for different sample weights in developing national estimates. This technique is outlined in Appendix A of the WQBA.

As summarized in Table 10-12, EPA estimated that under the proposed option, (as well as under COMBO and DAF) the Land Application-High standards would be met by all 10 of the affected POTWs, and the estimated annual disposal of sewage sludge newly qualifying for Land Application-High limits would increase slightly to 6,200 DMT.

Monetizing Benefits of Improved Sewage Sludge Quality

To estimate a monetary value for the increased quantity of sewage sludge qualifying for application under Land Application-High limits, EPA identified the additional requirements that must be met for application of bulk sewage sludge under Land Application-Low limits. The cost of these additional requirements will be saved by compliance with Land Application-High limits and will thus provide a partial

Table 10-12

Summary of Estimated Shifts in Sewage Sludge Use or Disposal Practices (National Estimates)

Shift Category	Regulatory Option	Number of POTWs	Associated Sewage Sludge Quantity (DMT/Year)
Upgrade from Land Application-Low limits to Land Application-High limits as a result of the indicated regulatory option	CP	10	6,200
	COMBO	10	6,200
	DAF	10	6,200

Source: U.S. EPA, WQBA.

measure of the monetary benefit of improved sewage sludge quality. EPA assumes that the following amounts of time would be needed to accomplish the required tasks:

- Incremental General Requirements for Applying Bulk Sewage Sludge under Land Application-Low Limits

  — Contact Permitting Authority for the state to determine whether bulk sewage sludge subject to Land Application-Low limits has been applied to the site since July 20, 1993 (needed for every application to any site; 0.5 to 1 hour per application given availability of state personnel to respond to request; the 1 hour time assumes several calls might be needed before contact is made).

  — If bulk sewage sludge subject to Land Application-Low limits has been applied to the site since July 20, 1993, the cumulative amount of each pollutant applied to that site since that date shall be used to determine the additional amount that can be applied under cumulative limits. (For each of the regulated metals, the applier needs to calculate how much of each metal was applied and the amount that can further be applied using equations in the Part 503 Appendix. It is expected that applications of sewage sludge under Land Application-Low limits by other POTWs to the same site are likely to be relatively uncommon, thus it is assumed that this paragraph entails negligible amounts of time.)

  — The Applier must provide written notice to the state Permitting Authority showing location of the application site, and name, address, telephone number and NPDES number (if appropriate) of the Applier (this paragraph requires, for each application, looking through records, writing down the necessary information, and sending the information to the permitting authority; 0.5 to 1 hour per application).

- Incremental Recordkeeping Requirements for Bulk Sewage Sludge Land Applied Under Land Application-Low

  — The following records must be kept indefinitely

    1) Location of site (a one-time cost per site; negligible on annual basis)

    2) Date and time of application (negligible)

    3) Number of hectares at site (a one-time cost per site; negligible on annual basis)

    4) Amount of each pollutant applied (including amount applied by others) (0.5 to 1 hour per application; involves calculations for each regulated pollutant using equations provided in the Part 503 appendices)

    5) The total amount of sewage sludge applied (negligible time; assumed included in 4, above).

6) A certification statement (negligible time)

7) A description of how requirements to obtain information to meet the general requirements (see above) were met (documentation, copying, and filing of all information gathered under general requirements for each application (0.5 to 1 hour per application).

EPA computes a total amount of time needed per application to comply with the incremental requirements associated with applying sewage sludge under cumulative limits by summing the above estimates: 2 to 4 hours per application. Materials costs for meeting these requirements are considered negligible, thus the benefit of the proposed IL Standards will result from a time savings, which can be monetized.

To estimate the number of sewage sludge application a POTW would make each year, EPA made the following assumptions: 1) a 40-acre site is a typical site size for land application (approximately 16 hectares) and 2) typical application rates for land application are on the order of 7 dry metric tons (DMT) per hectare per application.[49] A total of 885 hectares might be required given these application rates. If a typical site is 16 hectares, these POTWs might be making one application per year to approximately 56 sites. At 2 to 4 hours of recordkeeping time per application per site, the time involved might be 111 to 221 hours per year. Given a fully loaded rate for labor at POTWs of $42 per hour,[50] $5,000 to $9,000 might be saved per year. The actual value of this recordkeeping time savings for any POTW's sewage sludge management will vary depending on amount of sewage sludge generated, the site size, application rate, and time to perform recordkeeping tasks.

Note, however, that there are additional benefits that are not easily monetized. If a POTW's sewage sludge meets Land Application-High limits, it may be easier to convince farmers to take the sewage sludge (through the advantage of having a "clean" sludge), thus reducing time to locate application sites, and possibly allowing the POTW to sell the sewage sludge instead of giving it away. Furthermore, if a POTW decides to meet the more stringent Class A pathogen and vector attraction reduction requirements (by composting sewage sludge, for example), the subsequent product is not subject to any Part 503 requirements, increasing its ease of distribution. Additionally, this composted sewage sludge might command a higher price

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[49] U.S. EPA, 1993. *Technical Support Document for Land Application of Sewage Sludge.* Section Six. Office of Water.

[50] See Section 10.2.3.2 of this EA and EPA, 1995. *Op. cit.*

than that for a similarly composted sewage sludge subject to annual limits (which apply when the sewage sludge does not meet Land Application-High limits).

10.4.5 Limitations of the Benefit Estimation Methodology

This analysis considers three broad benefit categories: human health benefits, ecological benefits, and economic productivity benefits (including efficiency benefits to POTWs), each of which includes more narrowly defined benefit measures. Although EPA endeavored to quantify and monetize as many benefit measures as possible, the quantified and monetized benefits do not represent a full set of benefits expected to accrue from the proposed rule.

- *Human Health Benefits.* This analysis considers two measures of human health benefits: 1) reduction in cancer cases from consumption of chemically contaminated fish tissue; and 2) reduced frequency of pollutant concentrations in excess of health-based AWQCs. These measures, however, are not inclusive of all possible human health benefits and therefore do not provide a comprehensive estimate of the total human health benefits associated with the proposed rule. Moreover, analyses of possible health benefits were not possible for a significant number of the pollutants whose discharges would be reduced by the proposed rule.

- *Ecological Benefits.* The estimated increases in value to recreational fishing and nonuse ignore other recreational activities such as swimming, wildlife observation, increased assimilative capacity of an industrial laundries reach, and improvements in the taste and odor of the water.

- *Economic Productivity Benefits.* This analysis considers two measures of economic productivity benefits: 1) reduced interference with POTW operations and 2) reduced pollutant contamination of sewage sludge at POTWs receiving discharges from industrial laundries facilities. However, these two measures do not fully capture all possible economic productivity benefits associated with the proposed rule (e.g., enhanced diversionary uses).

Also, the methodologies used to quantify and monetize benefit values involve significant simplifications and uncertainties. Whether these are likely to lead to an understatement or overstatement of the estimated economic values is not known. Simplifications and uncertainties applying to the human health benefits analysis as well as the ecological benefits analysis include selection of the sample of industrial laundries facilities analyzed in this EA, estimation of in-waterway concentrations of industrial laundries pollutants, consideration of background concentrations of industrial laundries pollutants, and consideration of downstream effects. The additional elements of uncertainty specific to the ecological benefits analysis involve the location of the reaches expected to benefit from elimination of pollutant concentrations in excess of AWQC limits; the estimation of the value to recreational fishermen of reducing concentrations of industrial laundries pollutants to levels considered protective of aquatic life and human health; and whether the valuation of enhanced recreational fishing opportunities overlaps the valuation of reduced cancer health from fish consumption. Finally, simplifications and uncertainties associated with estimation of POTW benefits include omitting other sources of industrial laundry pollutants. Elements of the analysis involving significant simplifications and uncertainties are discussed below.

Sample Design and Analysis of Benefits by Location of Occurrence

The portion of the industrial laundries industry that would be required to meet the proposed IL Standards is estimated to include 1,606 facilities. Many of these facilities are quite small and discharge relatively small quantities of pollutants. However, in aggregate, the industry discharges a significant quantity of pollutants. Although most individual facilities are not likely to have a significant adverse impact on the human health risks considered in this analysis, the combined discharges to a given reach might cumulatively affect human exposure. The sample of industrial laundries facilities was based on the business and operating characteristics of the industry rather than geographic location. As a result, the sample does not accurately reflect the likelihood of multiple industrial laundries facilities on a given reach and, therefore, the contribution to in-waterway pollutant concentrations made by these facilities.[51]

Occurrence of multiple dischargers on a reach does not create a problem in the analysis of marginal cancer risk, because each facility's contribution to total risk can be estimated separately and is assumed to be linearly additive over the facilities, chemicals, and human populations that are affected by changes in pollutant discharges. Therefore, the application of sample weights will account for pollutant contributions from facilities co-occurring on industrial laundries reaches that are not present in the sample of facilities. However, in the analysis of AWQC exceedences for reaches receiving multiple industrial laundries facility discharges, the estimated change in pollutant concentrations from reduced discharges should account for the

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[51] Approximately 23 percent of the sample reaches receive discharges via POTWs from more than one industrial laundry facility.

total discharge of pollutants from the multiple facilities. As a result, for facilities with unequal sample weights, the extrapolation to the population cannot be accomplished by simply multiplying estimated benefit values by the sum of the sample weights of the individual facilities.[52] To address this problem, EPA applied an alternative sample extrapolation method that recognizes the differential weight of facilities discharging to the same reach. The differential weighting methodology does not account, however, for the contributions made by co-occurring facilities *not included in the sample*. This omission might lead to an understatement of benefits.

Estimation of In-Waterway Concentrations of Industrial Laundries Pollutants

Human health benefits were based on the estimated changes to in-waterway concentrations of pollutants discharged by industrial laundries facilities. Background contributions to concentrations of analyzed pollutants, either from other upstream sources or contaminated sediments from previous discharge practices, were not incorporated. This is likely to understate the occurrence of baseline AWQC exceedences and might therefore understate the reduction in AWQC exceedences as a result of the proposed rule. Second, pollutant fate processes such as adsorption to sediments and volatilization, which would lower in-waterway pollutant concentrations, were not considered.

Estimation of the Exposed Fishing Population

EPA's estimation of the exposed fishing population relied on state fishing license statistics and census data. If other factors influence the proportion of anglers in the local population, benefits may be understated or overstated. In addition, data limitations hamper the estimate of the number of anglers who actually fish a given industrial laundries reach. Estimating the number of anglers fishing industrial laundries reaches based on the ratio of industrial laundries reach length to the total number of industrial laundries reach miles in the county recognizes the effect of the *quantity* of competing fishing opportunities on the likelihood of fishing a given industrial laundries reach, but it does not account for the differential *quality* of fishing

[52] See Appendix A in the WQBA for an explanation of the sample weighting methodology devised to partially address this problem.

opportunities. If water quality in substitute sites is distinctly better or worse, the estimates of the exposed populations are likely to be overstated or understated.

Also, subsistence anglers were assumed to account for an additional 5 percent of the fishing population. The magnitude of subsistence fishing in the United States or in individual states, however, is not known. As a result, this estimate might understate or overstate the actual number of subsistence anglers.

Finally, to account for the effect of a fish advisory on fishing activity, and therefore on the exposed fishing population, EPA reduced the fishing population at an industrial laundries reach under a fish advisory by 20 percent. This approach could lead to either an overestimate or underestimate of the risk associated with consumption of contaminated fish, because 1) anglers who change locations might simply be switching to other locations where advisories are in place and therefore maintain or increase their current risk and 2) anglers who continue to fish contaminated waters might change their consumption and preparation habits to reduce the risks from the contaminated fish they consume.

Location of the Reaches Expected to Benefit from Elimination of Pollutant Concentrations in Excess of AWQC Limits

One of the sample reaches estimated to benefit from the proposed regulation has a very low stream flow value: this value is exceeded in more than 98.5 percent of the reaches to which sample facilities discharge. At the same time, this facility has a relatively high sample weight based on the industrial laundry facility class from which the sample was drawn. Because sample stratification and associated weights were not based on discharge site characteristics, EPA judges that the flow characteristics of this *sample* site may not be representative of the *nonsample* discharge sites that this sample site represents. Accordingly, it may not reasonable to assume that the elimination of AWQC exceedences as estimated for this sample site will recur in the analysis population with the same frequency as the facility's sample weight. Recognizing this problem, EPA did not use the standard method to extrapolate sample results to national estimates at this particular site. Instead, EPA used a sample weight of one, assuming that this benefitting site represents itself but does not represent nonsample sites.

To the extent that some of the nonsample sites represented by the benefitting sample site might have similar stream flow characteristics, the national estimates from this sample site might understate the national benefits from reduced industrial laundries discharges.

Estimating the Value to Recreational Fishermen of Reducing Concentrations of Industrial Laundries Pollutants to Levels Considered Protective of Aquatic Life and Human Health

The estimation of the monetary value of enhanced recreational fishing opportunities is based on findings from Lyke's contingent valuation (CV) study, which involves a number of assumptions regarding the comparability of pollutant contamination situations, affected water and fishery resources, and recreational anglers' perceptions of the effects of reduced pollutant contamination. Although benefit transfer is by no means a perfect method for estimating benefits, it is often the only available mechanism for estimating the economic benefit to society. EPA partly addressed this limitation by using only the *percentage increase values* from Lyke's study rather than absolute dollar estimates of willingness-to-pay, and combining these values with baseline resource values that involve site-specific information.

Another limitation associated with the concept of a contaminant-free fishery is that elimination of AWQC exceedences in a waterway is not strictly equivalent to achieving contamination-free status. As such, the value of recreational fishing benefits estimated in this analysis might be overstated.

Potential Overlap in Valuation of Enhanced Recreational Fishing Opportunities and Reduced Cancer Risk Via the Fish Consumption Pathway

The valuation of ecological benefits based on enhanced recreational fishing experience might overlap with the valuation of human health benefits from reduced cancer risk. The numerical significance of this overlap, if any, will depend on the following conditions:

- *The extent to which the increased value placed by recreational anglers on enhanced recreational fishing opportunities includes some valuation of reduced cancer risk from fish consumption.* The higher value of a contaminant-free fishery is also likely to reflect other concepts than reduced health risk. Anglers may attach a higher value to reduced pollution in the fishery because they expect that the fishery will be more productive or because they intrinsically value reduced pollution in the waterways in which they fish.

- *The extent to which public perception of health risk reflects scientific data measuring health risk.* The welfare measure of achieving a contaminant-free fishery estimated by a contingent valuation method is based on consumers' response to the CV questions regarding willingness-to-pay for achieving a contaminant-free fishery. Although consumers' responses are likely to embody valuation based on reduced human health risk, this welfare measure is based on consumers' subjective probabilities assigned to the risk factors. Thus, lack of information about consequences of contaminated fish consumption is likely to result in significant differences between scientific data measuring health risk and public perception of the risk factors. For example, only 10 to 34 percent of anglers *who are aware of advisories* change their fishing behavior by no longer fishing a particular location or taking fewer fishing trips in response to the advisory.[53] Thus, the valuation of enhanced recreational fishing opportunities overlaps, but does not fully capture, the valuation of reduced cancer risk from fish consumption. The magnitude of this overlap is uncertain, because it is virtually impossible to assign subjective probabilities.

- *The extent to which the valuation of ecological improvements and reduced cancer risk involves the same benefit sites and the same benefitting populations.* Although the potential for "double counting" of regulatory benefits exists, it is likely to be minor because benefits from ecological improvements are estimated based on elimination of AWQC exceedences on 66 reaches, whereas benefits from avoided cancer cases are calculated based on reduced discharges from all 1,606 industrial laundries facilities, which, in turn, are estimated to discharge to more than 1,000 reaches. Thus, only 6.6 percent of the discharge reaches benefitting from the reduced incidence of cancer are expected to benefit from ecological improvements.

- *The extent to which the improvements in ecological habitat, as indicated by the elimination of AWQC exceedences, are based on the same industrial laundries pollutants used to evaluate reduced cancer risk from fish consumption.* The concept of reduced health risk reflected in the higher value of a contaminant-free fishery is likely to embrace not only reduced cancer risk but other noncancer health risks as well. The analysis of ecological benefits and enhanced recreational fishing opportunities is based on 64 pollutants, or 56 more chemicals than in the cancer risk analysis. Moreover, of the eight chemicals exhibiting

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[53] Belton, T., R. Roundy, and N. Weinstein, 1986. Urban fishermen: Managing the risks of toxic exposure." *Environment*. Vol. 28., No. 9, November. Knuth, B., and C. Velicer, 1990. "Receiver-centered risk communication for sportfisheries: Lessons from New York licensed anglers," Paper presented at the American Fisheries Society, Annual Meeting, Pittsburgh, PA, August. Silverman, W., 1990. *Op. cit.* West, P., R. Marans, F. Larkin, and M. Fly. 1989. *Michigan Sport Anglers Fish Consumption Survey: A Report to the Michigan Toxic Substances Control Commission.* University of Michigan School of Natural Resources, Natural Resources Sociology Research Lab, Technical Report #1, May. Connelly, N., B. Knuth, and C. Bisogni, 1994. *Effects of the Health Advisory and Advisory Changes on Fishing Habits and Fish Consumption in New York Sport Fisheries.* Human Dimensions Research Unit, Dept. of Natural Resources, New York State College of Agriculture and Life Sciences, Cornell University, HDRU Series No 92-9, September. Connelly, N., and B. Knuth, 1993. *Great Lakes Fish Consumption Health Advisories: Angler Response to Advisories and Evaluation of Communication Techniques.* Human Dimensions Research Unit, Dept. of Natural Resources, New York State College of Agriculture and Life Sciences, Cornell University, HDRU Series No 93-3, February.

carcinogenic effects, seven are also identified as noncancer toxicants. Finally, the proposed regulation would reduce discharge of carcinogens and noncancer toxicants to humans and aquatic life by 1,172 and 37,889 toxic pounds per year, respectively. Given that carcinogens comprise only 3 percent of the reduced discharges of toxic chemicals to the benefitting reaches, the component of value for enhanced recreational fishing that depends on reduced cancer risk may be relatively small in relation to the total assessed value for enhanced recreational fishing opportunities.

In summary, although the potential for overlap exists in the valuation of enhanced recreational fishing experience and the valuation of human health benefits, the practical numerical significance of the overlap is likely to be small.

Nonuse Benefits

The contingent valuation method is the only methodology currently available for estimating nonuse values of natural resources. For this analysis, an original contingent valuation study was not a viable option because it is very resource intensive. Thus, EPA estimated the increase in nonuse values resulting from the proposed regulation based on previous CV studies. Because the significance of nonuse value depends on many factors (such as the irreplaceability of the resource, whether the resource is regionally or nationally significant, whether threatened or endangered species or their habitats are involved, and whether use is rationed), the effect of this simplified approach to estimation of nonuse benefits is uncertain. However, given that EPA used a conservative lower bound estimate of the ratio of use to nonuse values, this approach is likely to underestimate the nonuse benefits resulting from the proposed rule.

Limitations of the POTW Benefit Estimation Methodology

EPA did not account for "other source contributions" of industrial laundries pollutants to estimate the concentrations of these pollutants at relevant measurement points. Accounting for the discharges from other sources is important because the assessment of gains from reduction of POTW inhibition and improved sewage sludge management practices depends on comparisons of estimated pollutant concentration values with applicable thresholds and identifying situations in which threshold criteria are failed in the baseline case but met under a regulatory option. In such an analytic framework, failure to account for other source contributions is likely to lead to an underestimate of the environmental problems that might be ameliorated by the proposed IL Standards.

In addition, the monetization of POTW benefits considers only the reduced costs associated with lower recordkeeping and reporting requirements for application of sewage sludge under the Land Application-High criteria instead of the Land Application-Low criteria. Other benefits, for example, greater acceptance of the sewage sludge meeting Land Application-High limits, are not accounted for.

10.4.6 Total Monetized Benefits

EPA developed a partial monetary estimate of expected benefits for the proposed regulation in three categories: human health, ecological, and economic productivity. As noted in Section 10.4.3, the valuation of ecological benefits based on enhanced recreational fishing experience may overlap with the valuation of human health benefits. Although the extent of this overlap is uncertain, EPA believes it is likely to be small (see Section 10.4.3). Therefore, for this analysis, EPA assumed that ecological improvements and human health benefits are additive. Summing the monetary values reported in the preceding sections across these categories results in total monetized benefits of $2.64 to $9.58 million ($1993) annually for the proposed regulation (see Table 10-13). As reported in Table 10-13 total monetized benefits for COMBO and DAF range from $2.64 to $9.56 million. Therefore, the monetary value of benefits from the proposed option exceed the corresponding values of monetary benefits of COMBO and DAF only slightly, if at all.

As noted in Section 10.4.1, this benefit estimate is necessarily incomplete because it omits numerous mechanisms by which society is likely to benefit from reduced effluent discharges from the industrial laundries industry (see discussion below in Section 10.5).

10.5 COMPARISON OF ESTIMATED COSTS AND BENEFITS

Table 10-14 presents the social costs and benefits of the proposed rule. Only the costs and benefits of the preferred option are presented here. The CP option has the largest net benefits as well as the best cost-benefit ratio of all options considered.

Table 10-13

Total Monetized Benefits from the IL Standards (millions of 1993 dollars)

Regulatory Option	Benefit Values by Categories				Total Value of Benefits *
	Human Health	Recreational Fishing	Nonuse	Sewage Sludge Improvements	
CP	$0.086 - $0.456	$1.70 -$6.08	$0.85 - $3.04	$0.005 - $0.009	$2.64 - $9.58
COMBO	$0.082 - $0.433	$1.70 - $6.08	$0.85 - $3.04	$0.005 - $0.009	$2.64 - $9.56
DAF	$0.082 - $0.433	$1.70 - $6.08	$0.85 - $3.04	$0.005 - $0.009	$2.64 - $9.56

* The total value of benefits is estimated by summing the monetary values across four benefit categories (i.e., human health, recreational fishing, nonuse and sewage sludge improvements).

Source: Table 10-9 and text of Section Ten.

Table 10-14

Total Costs and Benefits of the IL Standards under the CP Option (Millions 1993 Dollars)

Type of Cost or Benefit	Total Social Cost or Benefit
Compliance Costs	$123.38
Administrative Costs	$2.60
Employment Administrative Costs	$0.10
Total Social Costs	$126.09
Human Health Benefits	$0.086 - $0.456
Recreational Benefits	$1.70 - $6.08
Nonuse Benefits	$0.85 - $3.04
POTW Benefits	$0.005 - $0.009
Total Benefits	$2.64 - $9.58

Source: Table 10-3 and Table 10-13 of this EA.

As the table shows, the CP option is associated with costs totaling $126.09 million, with benefits totaling $2.64 million to $9.58 million. The largest benefit category is recreational benefits, with 65 percent of the total dollar value of benefits. Note that the estimate for benefits does not include the dollar value of many important benefits for which monetized estimates could not be developed. Examples of benefit categories not reflected in this estimate include noncancer-related health benefits, reduced POTW maintenance cost, reduced costs for POTWs to write individual permits, enhanced diversionary uses, improved aesthetic quality of waters near discharge outfalls, enhanced water-dependent recreation other than fishing, benefits to wildlife and to threatened or endangered species, tourism benefits, and biodiversity benefits.

APPENDIX A

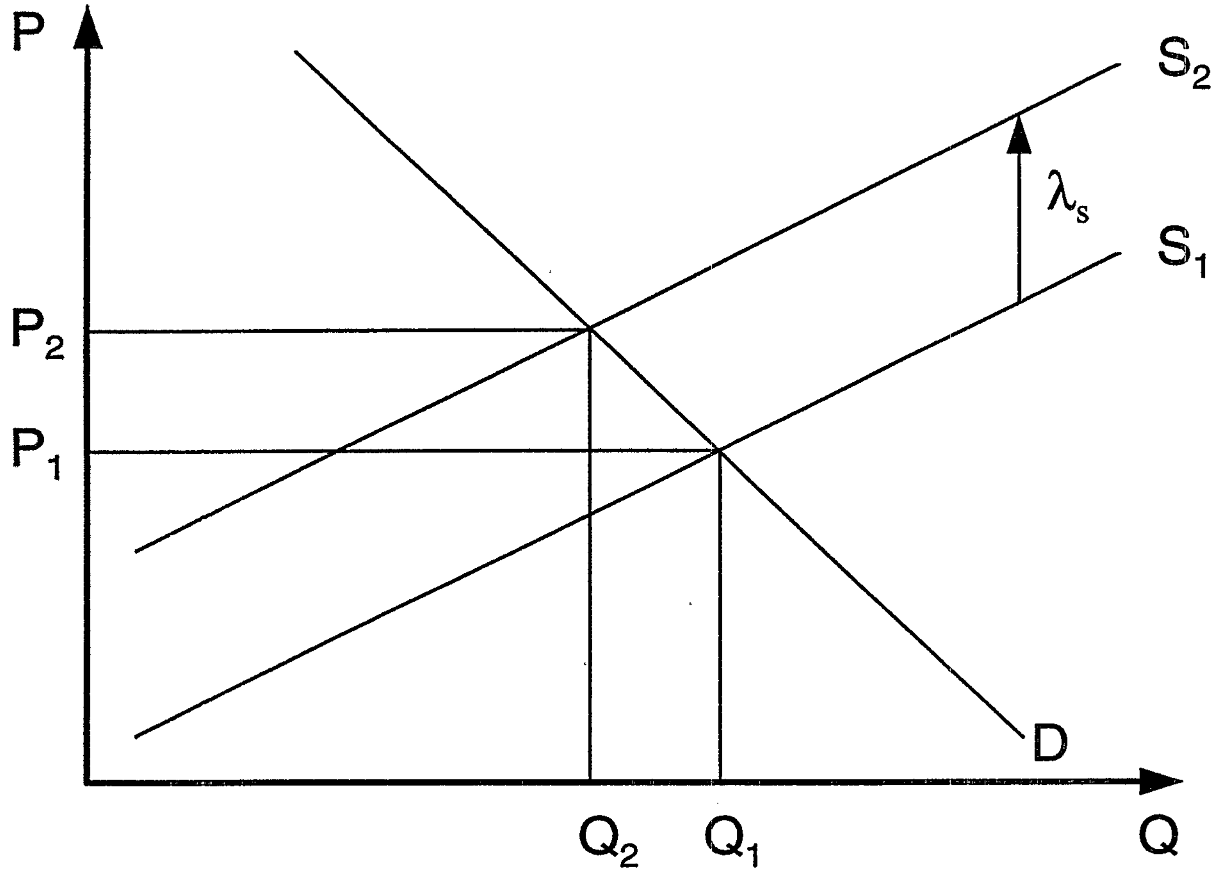
MARKET MODEL METHODOLOGY AND RESULTS

The economic impact analysis of the IL Standards considers the potential changes in market price and industry output that could result from increased pollution control costs. EPA uses a market model comprising an industry supply and demand curve to estimate changes in market price and quantity due to the IL Standards. This appendix describes EPA's market model methodology for the industrial laundries industry. Section A.1 presents an overview of the model used to estimate the economic impacts of the regulation. Section A.2 provides a description of the methodology used for estimating preregulatory market conditions (i.e., the market supply and demand equations, the methodology used to construct the variables in the model, and the methodology for estimating preregulatory price and quantity). Section A.3 presents the methodology used to estimate the postregulatory market conditions. Section A.4 presents the results of the pre- and postregulatory analyses.

A.1 OVERVIEW OF THE INDUSTRIAL LAUNDRIES MARKET MODEL

A market *demand* curve shows the relationship between market price and the quantity demanded, while a market *supply* curve shows the relationship between market price and the quantity supplied. The market is in equilibrium when the market price is such that the quantity demanded by industrial laundering customers is equal to the quantity that industrial launderers are willing to supply. Quantity, in this case, refers to pounds laundered. EPA assumes that the industrial laundries market is in equilibrium with the supply and demand curves that determine preregulatory market price and quantity prior to the implementation of the IL Standards. The postregulatory scenario will show a shift in the market equilibrium due to a shift in the supply curve resulting from industry cost increases associated with the IL Standards.[1] Figure A-1 illustrates industry demand and supply curves under preregulatory and postregulatory conditions, showing these shifts.

[1] The industry supply curve is the aggregate of all facilities' marginal cost curves. Pollution control costs add to each facilities' marginal cost, so the marginal cost curves of all facilities shifts upward (see Figure A–1). This shift is *very* small. The difference between baseline production (Q_1) and post compliance production (Q_2) under the CP option is only about 29 million pounds out of a total baseline production of nearly 9 billion pounds or 0.3 percent of current production.



D, S_1 = preregulatory market demand and supply
D, S_2 = postregulatory market demand and supply
P_1, Q_1 = preregulatory equilibrium price and quantity
P_2, Q_2 = postregulatory equilibrium price and quantity
λ_s = supply shift = weighted average increase in marginal cost due to regulation

Figure A-1. Pre-and postregulatory supply and demand for the industrial laundries industry.

Although the discussion in this section focuses on market supply and demand, it is important to consider firm-level conditions, because these conditions influence market conditions. As shown in the industry profile, the industrial laundries industry is, in most markets, considered a competitive industry. As such, firms in this industry can be viewed as price takers, in that each firm takes the market price as given and has no ability to influence that price. In effect, each firm in this industry faces a horizontal demand curve: at any level of output the firm faces the same market price. Given the market price, each (competitive) firm maximizes its profits by producing at a level where marginal cost is equal to price. Thus, the marginal cost curve also represents the supply curve for the individual firm under most circumstances.

Increased pollution control costs cause each firm's marginal cost curve (i.e., its supply curve) to shift upward because the cost of production has increased at each point on the marginal cost curve. When the marginal cost curve shifts up, the competitive firm responds with a lower level of production at each price level to maximize its profits.[2] The market supply curve, which is the sum of the individual firm supply curves, also shifts upward and to the left, from S_1 to S_2 (see Figure A-1), resulting in an increase in the equilibrium market price for industrial laundering services. Ultimately, when the market adjusts to the impact of increased pollution control costs due to the IL Standards, market equilibrium will reflect a higher price and lower quantity than the preregulatory price and quantity. The industry now faces a new market price of P_2 and supplies Q_2 of industrial laundering services.

The market model assumes that the demand curve does not shift as a result of the implementation of the IL Standards. This assumption is appropriate because, although changes in pollution control costs affect the production costs of industrial launderers, production costs are supply-side variables and do not shift the market demand curve. However, at the new, higher price, consumers purchase less, which is represented as a movement along the demand curve as a result of the change in market price.

Market impacts depend on the extent to which increases in production costs due to the regulation cause a decrease in the market supply for industrial laundering services and the extent to which higher costs can be passed on to customers through higher prices. The final results of the market model include:

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[2] Pollution control costs are the costs incurred by all facilities in the industry to reduce or minimize the amount of pollutants that are contained in the effluent from industrial laundries. This cost causes a very small shift in the supply curve (see footnote above).

- An estimate of preregulatory market supply and demand curves.
- An estimate of postregulatory market price and quantity.
- Price elasticities of supply and demand that will be used to estimate the postregulatory price, which is used in turn to estimate an industry percentage cost passthrough (CPT). The percentage CPT can be used to revise facility estimates of total posttax annualized costs, which then can be input into the facility and firm financial impact analysis models.

A.2 PREREGULATORY MARKET CONDITIONS

This section provides a detailed discussion of the methodology for modeling the preregulatory market conditions. Section A.2.1 lays the groundwork for the preregulatory market analysis by introducing the preregulatory market supply and demand equations. Section A.2.2 defines the market model variables used in the supply and demand equations, provides a discussion of the sources of data for each of the variables and the methodologies used to construct the variables, and presents the data used in the market model analysis. Section A.2.3 outlines the steps used to solve for (estimate) the preregulatory market equations that pass through the 1993 market equilibrium point and presents the elasticities of supply and demand for the industrial laundries industry.

A.2.1 Market Supply and Demand Equations and Market Equilibrium Conditions

The supply and demand relationships represent a system of interdependent equations in which price and quantity are determined simultaneously to reach a common solution that satisfies both equations. In theory, these equations mimic the market interactions of industrial launderers and their customers and the resulting price and quantity are those that would be faced in the market.

For this model, market supply is assumed to be a function of market price and the Producer Price Index (PPI).[3] Market demand is assumed to be a function of market price and the U.S. population.[4] In

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[3] Although a term for pollution control costs does appear in the preregulatory model, some facilities that were surveyed in the Section 308 Survey reported having some level of pollution control equipment in place. For the purposes of this model, EPA assumes that existing unit pollution control costs (costs per pound of laundry processed) for all facilities have remained constant in the years prior to the regulation, enabling EPA to consider the marginal effect of incremental pollution control costs that result from the IL Standards. As a constant value in the preregulatory market, preregulatory pollution control costs appear as (continued...)

addition, the demand and supply relationships are assumed to be log-linear in form. Given these relationships, the market supply and demand equations (which are used to estimate the elasticities of supply and demand [ϵ and η]) can be written as follows:

Preregulatory Supply

$$\ln Q_s = \ln\alpha_s + \epsilon \ln P_t + \theta_1 \ln PPI_t \tag{1}$$

Preregulatory Demand

$$\ln Q_d = \ln\alpha_d + \eta \ln P_t + \theta_2 \ln Pop_t \tag{2}$$

where,

Q_s = market supply

α_s = supply constant

P_t = market price

ϵ = coefficient for P_t in the supply equation (supply elasticity)

PPI_t = Producer Price Index

θ_1 = coefficient for PPI_t

Q_d = market demand

α_d = demand constant

η = coefficient for P_t in the demand equation (demand elasticity)

Pop_t = United States population

θ_2 = coefficient for Pop_t

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[3](...continued)
part of the constant term for the supply equation, α_s, and not as a separate term. A term for incremental, or marginal, pollution control costs appears in the postregulatory market model.

[4]PPI is a proxy for input costs and Pop is a proxy for shifts in demand.

To identify the supply and demand relationships econometrically, each equation must contain at least one exogenous variable that does not influence the other equation. This is a prerequisite for obtaining intersecting supply and demand curves and thus a prerequisite for obtaining a solution to the system of simultaneous equations. For the supply equation, PPI is an exogenous variable and is expected to influence market supply but not market demand. For the demand equation, U.S. population is an exogenous variable, expected to affect market demand but not market supply. Because market supply and demand curves show the relationship between industry output, (i.e., quantity supplied or quantity demanded) and market price, these variables (quantity and price) are common to both the supply and demand equations. Each of the variables used in the market model equations are defined and discussed in Section A.2.2.

A.2.2 Supply and Demand Variables

To measure the impacts of the regulation, actual data for the four market model variables (i.e., industry output, market price, PPI, and population) must be input into the model. After an extensive search, EPA found that industry output and market price data for the industrial laundries industry are not available through government sources, trade associations, other organizations, or databases that monitor industry information. For this reason, EPA estimated historical values of output and price from information provided in the industrial laundries detailed questionnaire database and data available through the U.S. Census Bureau and the U.S. Bureau of Labor Statistics, and obtained information for the PPI and population variables from various published sources (see Sections A.2.2.1-A.2.2.4 for exact references). Each of the variables in the market model are discussed below in detail. The variables for both the market supply and demand equations are based on historical data for the years 1978 through 1993, which incorporate a sufficient span to account for industry behavior and trends. Table A-1 presents the data used to estimate the industrial laundries industry market supply and demand curves.

A.2.2.1 Industry Output (Q)

Industry output is defined as the total pounds laundered by all industrial laundry facilities. EPA constructed estimates of historical industry output data using 1993 industry output data, calculated from

Table A-1

Data Used To Estimate The Industrial Laundries Industry Supply And Demand Curves

Year	Production (million pounds)	Price (1993 dollars)	PPI	U.S. Population (millions)
1978	7779.31	$0.39	58.79	222.59
1979	8196.14	$0.42	66.19	225.06
1980	7917.85	$0.47	75.53	227.73
1981	7743.09	$0.52	82.42	229.97
1982	7644.65	$0.56	84.10	232.19
1983	8048.45	$0.54	85.20	234.31
1984	7971.83	$0.60	87.22	236.35
1985	8022.24	$0.62	86.80	238.47
1986	8024.72	$0.68	84.27	240.65
1087	8143.82	$0.72	86.46	242.80
1988	8538.13	$0.75	89.91	245.02
1989	8563.08	$0.76	94.37	247.34
1990	8582.26	$0.77	97.81	249.91
1991	9136.66	$0.74	97.98	252.65
1992	8534.47	$0.83	98.57	255.46
1993	8776.27	$0.81	100.00	258.25

Source: EPA sources and estimates as described in text of Sections A.2.2.1 through A.2.2.4.

survey data contained in the Section 308 Survey database and historical employment data.[5] Industry employment was used to construct pre-1993 industry output because employment is an input into the industrial laundries' production process and directly affects the level of output.

To estimate industry output, EPA assumed that no significant changes in worker productivity occurred over the period analyzed. To explore the effect of this assumption on the model results, EPA used a productivity factor constructed by the Bureau of Labor Statistics to conduct a sensitivity analysis for worker productivity. The productivity factor did not improve the regression results and therefore was not included in the final model. One possible explanation for poor results using the productivity factor is that this factor is based partly on industry revenues and not at all on actual production data. Due to the lack of an effective alternative proxy for changes in worker productivity, EPA has assumed a constant 1993 level of worker productivity in the industrial laundries industry between 1978 and 1993. If, as is generally expected, worker productivity improved over the last fifteen years, the estimates for historical output could be slightly high, particularly for the earlier years of the study period. Because the industry has not made radical technology changes over the study period, however, EPA believes such an overestimation of output would not be significant.

Industry output for 1978 to 1992 was constructed by scaling 1993 industry output estimates based on industry employment. EPA derived estimates of historical industry output data using 1) 1993 output estimates from the Section 308 Survey database, 2) 1993 employment estimates from the detailed questionnaire database, and 3) historical employment figures by SIC codes (note new classification scheme presented in Table 2-1 in Section Two of this EA).[6]

Industry output for 1993 was estimated by calculating total output for the population of industrial laundry facilities contained in the detailed questionnaire database. Because the survey was not a census, EPA weighted output data for each facility by a facility-specific sample weight to scale the data to the

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[5] EPA obtained historical employment data for 1978-1993 from *County Business Patterns*, U.S. Department of Commerce, Bureau of the Census.

[6] EPA obtained historical employment data for 1978-1993 from *County Business Patterns*, U.S. Department of Commerce, Bureau of the Census.

affected population of industrial laundering facilities. EPA used the following equation to estimate total output for all industrial laundry facilities for 1993:

$$Q_{1993} = \Sigma_i(q_i w_i) \tag{3}$$

where,

q_i = output for sampled facility i in 1993

w_i = facility-specific weight factor for facility i

Q_{1993} = output for all facilities in 1993

EPA estimated industry employment ratios using several steps, the first of which involved calculating population estimates for 1993 employment for the three most prevalent SICs in the database: 7211, 7213, and 7218.[7] (The SICs are used in the next step to tailor census employment data to the facilities represented in the detailed questionnaire database.) These three SICs were chosen because their employment represents over 96 percent of total employment for facilities in the database. The mathematical expression for this can be written as follows:

$$E_{weighted_{SIC}} = \Sigma_{SIC}\ (e_i w_i) \tag{4}$$

where,

$E_{weighted_{SIC}}$ = weighted 1993 employment by SIC

e_i = employment for facility i in 1993

w_i = facility-specific weight factor for facility i

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[7] See Table 2-1 in Section Two of this EA for the new designations for these industries under the NAICS codes.

Because only 1993 output and employment data were collected in the detailed questionnaire, EPA used Census Bureau data to construct historical data for these variables. EPA compared total 1993 employment for the three selected SICs to 1993 total Census Bureau employment figures for those same SICs. The ratios resulting from this comparison were multiplied by the Census Bureau employment data for each SIC for each of the years between 1978 and 1993, then summed across SICs, to estimate total employment in the population for each of these years. Mathematically, this can be written as follows:

$$E_t = \Sigma_{SIC} \frac{e_{weighted_{1993_{SIC}}}}{e_{census_{1993_{SIC}}}} (e_{census_{t_{SIC}}}) \tag{5}$$

where,

E_t = total employment in weighted population in year t

$e_{weighted_{1993_{SIC}}}$ = employment in weighted population in 1993 by SIC

$e_{census_{1993_{SIC}}}$ = census employment in 1993 by SIC

$e_{census_{t_{SIC}}}$ = census employment in year t

EPA scaled total employment for each year by total employment for 1993, so that 1993 became the base year, then multiplied by 1993 output to obtain output figures for each year between 1978 and 1993. This can be expressed using the following equation:

$$Q_t = \frac{E_t}{E_{1993}}(Q_{1993}) \tag{6}$$

where,

Q_t = total output for weighted facilities in year t

E_t = total employment for the weighted population in year t

E_{1993} = total employment for the weighted population in 1993

Q_{1993} = total output for all facilities in 1993

A.2.2.2 Market Price (P)

Market price is defined as the average receipts per pound that industrial launderers receive for the services they provide. EPA constructed market prices for 1978 to 1992 by scaling 1993 industry revenue estimates obtained from the Section 308 Survey using industry revenues and CPI data. EPA derived estimates of historical market price from information provided by 1) industrial laundering facilities in the Section 308 Survey database, 2) historical revenue figures by SIC, and 3) CPI data.[8]

EPA calculated market prices by first estimating total 1993 receipts for the population of industrial laundry facilities contained in the detailed questionnaire database. EPA based total population receipts on facility revenue data and facility-specific weights and estimated them using the following equation:

$$Rev_{1993} = \Sigma_i (r_i w_i) \quad (7)$$

[8] EPA obtained historical revenue data from *Service Annual Surveys* for 1978-1993 published by the U.S. Department of Commerce, Bureau of the Census. Consumer Price Index data were obtained from the U.S. Department of Labor, Bureau of Labor Statistics.

where,

r_i = receipts for sampled facility i in 1993 revenues

w_i = facility-specific sample weight factor for facility i

Rev_{1993} = total revenues for weighted industrial laundering facilities in 1993

EPA then calculated revenue ratios and estimated total population receipts for 1993 for the three most significant SICs (7211, 7213, 7218), which represent over 96 percent of revenues for facilities in the database. These SICs are used to tailor Census Bureau revenue data to the facilities represented in the Section 308 Survey database. EPA derived these estimates as follows:

$$r_{weighted_{1993_{SIC}}} = \Sigma_{SIC} \, (r_i w_i) \tag{8}$$

where,

$r_{weighted_{1993_{SIC}}}$ = weighted 1993 revenues by SIC

r_i = revenues for facility i in 1993

w_i = facility-specific weight factor for facility i

Because only 1993 revenue data were collected in the detailed questionnaire, EPA used Census Bureau data to construct historical revenue figures. EPA compared total 1993 revenues for each of the three SICs to 1993 Census Bureau revenue figures for the same SICs, then multiplied these ratios by the Census Bureau revenues for each SIC for each of the years between 1978 and 1993. Summing across SICs, the Agency estimated total revenues in the population for each of these years. Mathematically, this approach can be written as follows:

$$Rev_t = \Sigma_{SIC} \frac{r_{weighted_{1993_{SIC}}}}{r_{census_{1993_{SIC}}}} \, (r_{census_{t_{SIC}}}) \tag{9}$$

where,

Rev_t = total revenues in weighted population in year t

$r_{weighted_{1993_{SIC}}}$ = revenues in weighted population in 1993 by SIC

$r_{census_{1993_{SIC}}}$ = census revenues for 1993 by SIC

$r_{census_{t_{SIC}}}$ = census revenues for year t

EPA scaled total revenues for each year by total revenues for 1993, so that 1993 became the base year, then multiplied by 1993 revenues to obtain revenue figures for each year between 1978 and 1993. EPA also multiplied the revenue figures by the ratio of two price indexes: 1) the *Consumer Price Index for Laundry and Drycleaning Services Other Than Coin-Operated* and 2) the overall CPI. This ratio provides an indication of how market prices for laundering services have changed relative to market prices for all goods and services. The equation used to estimate historical market prices is as follows:

$$R_t = \frac{Rev_t}{Rev_{1993}} (C_t) (Rev_{1993}) \qquad \textbf{(10)}$$

where,

R_t = total revenues for all facilities in year t

Rev_t = total revenues for the weighted population in year t

Rev_{1993} = total revenues for the weighted population in 1993

C_t = Consumer Price Index Ratio (CPI for industrial laundries / CPI for all industries) for 1978 to 1993

EPA estimated market price for 1978 to 1993 by dividing the aggregate revenue estimate for each year by the aggregate output estimate for each year (derived previously) to construct a price per pound for industrial items for each year between 1978 and 1993:

$$P_t = \frac{R_t}{Q_t} \qquad (11)$$

A.2.2.3 PPI

The PPI is a proxy for industrial laundering unit production costs and serves as an indicator of changes or trends in industrial laundering production costs. As stated above, changes in production costs directly influence the level of services that industrial launderers are willing to supply to the market at any given market price. EPA obtained the PPI for All Commodities for 1978 through 1993.[9]

A.2.2.4 United States Population (Pop)

The United States population serves as an indicator of changes in demand for industrial laundering goods and services because changes in the U.S. population affect the market demand for laundering services at any given price. EPA obtained the U.S. population data for 1978 through 1993.[10]

A.2.3 Estimating Preregulatory Conditions

EPA uses the equations and data as outlined above in a 2-stage least-square regression analysis to derive the preregulatory price elasticities of supply and demand. The result of this regression analysis are presented in Section A.4.1.

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[9] U.S. Department of Labor, *1995. Labstat Report Series*. Bureau of Labor Statistics.

[10] U.S. Department of Commerce, 1994. *Abstract of the United States: 1994.* Bureau of the Census.

A.3 POSTREGULATORY MARKET CONDITIONS

This section describes the changes in the postregulatory market that result from increases in regulatory compliance costs. Section A.3.1 discusses the methodology for estimating incremental pollution control costs. Section A.2.3 describes the methodologies used to estimate postregulatory price and quantity. Section A.3.3 describes the methodology for estimating the percentage CPT that is applied to the facility and firm closure models.

A.3.1 Estimating Incremental Pollution Control Costs

Industrial launderers that incur regulatory compliance costs as a result of the IL Standards would face increased production costs. When production costs increase, industrial launderers will decrease the amount of services they provide at any given price. As noted above, an increase in production costs will result in a very small upward shift of the market supply curve (see Figure A-1.) The market supply curve is the aggregation of each facility's marginal cost curves. Since the marginal cost of production is greater at every point along this curve, the marginal cost curve of each facility shifts up, as then does the industry supply curve. Demand does not shift; the supply curve shifts along the stationary demand curve. This results in higher prices and less demand for the product as well as lesser quantities of the product produced (in this case product is industrial laundry services). The very small production loss (estimated later in this appendix to be only 0.3 percent of current production) represents the difference between production demanded at the lower price and production that is no longer demanded at the higher postcompliance price. This very small loss in production might be replaced by substituting disposable products or onsite laundries for industrial laundries services, discontinuing uniform rentals and requiring employees to provide and launder their own clothing, or reducing the frequency with which laundry is picked up, washed, and delivered, among others.

EPA assumes that the market supply curve will shift such that the elasticity of supply remains unchanged, and solely because of the change in unit pollution control costs (compliance costs per pound or laundry processed). This assumption implies that unit pollution control costs vary with the level of output in the same way current operating costs do. This is a reasonable assumption that enables the change in the industry's average pollution control costs per unit of output to be used to determine the magnitude of the supply curve shift, as long as shifts in the curve are not large (which they are not).

Unit pollution control costs will be different for each firm and generally are not correlated with firm size. Therefore, EPA uses the weighted average incremental pollution control cost per unit of output to estimate the supply shift.[11] To calculate the weighted average pollution control costs, the incremental control costs for each facility are summed to yield total pollution control costs for the industry and then divided by total weighted output for the industry. This calculation is shown in the following equation:

$$\lambda = \frac{\Sigma_i cc_i w_i}{\Sigma_i q_i w_i} \tag{12}$$

where,

λ = weighted average incremental pollution control cost per unit of output

cc_i = incremental pollution control costs for facility i

w_i = facility-specific weighting factor

q_i = annual quantity for facility i

The numerator is the total cost of compliance for each option (presented in Table 4-3 in Section Four of this EA) and the denominator is the total pounds of laundry processed by the industry in 1993 (8.8 billion pounds—see Table A-1).

[11] Pollution control costs include capital costs and operating and maintenance expenses for each facility in the detailed questionnaire database. The pollution control costs have been weighted by a facility-specific sample weight to scale the costs associated with the survey sample to the population of industrial laundering facilities. In addition, the costs have been annualized over a 16-year period so that they remain constant over the lifetime of the pollution control equipment.

A.3.2 Estimating Postregulatory Price and Quantity

Postregulatory equilibrium price and quantity depend on the preregulatory supply and demand equations and the change in unit pollution control costs that result from the IL Standards. The unit pollution control cost, λ, is used in the postregulatory supply equation as a function of initial price. Using a constant price elasticity model, the shift in supply caused by compliance costs enters the supply equation as:

$$\text{Postregulatory change in unit cost of production} = \frac{P_1}{(1+\frac{\lambda}{P_1})} \quad (13)$$

This configuration allows EPA to model the shift in the supply curve assuming a constant elasticity of supply. EPA could also have specified a parallel shift in the curve, but this approach leads to small inconsistencies in computing postregulatory price and quantity. When evaluating small changes in unit costs, however, either assumption (a parallel shift or a constant-elasticity shift) leads to approximately the same change in price.

We can now solve for (estimate) postregulatory price (P_2) using the postregulatory supply and demand equations (in this case the demand equation is the same both pre- and postcompliance, since no shifts in demand are assumed):

$$\text{Postregulatory supply:} \quad \ln Q_s = \ln\alpha_s + \epsilon \ln P_s - \epsilon \ln(1+k) + \theta_1 \ln PPI \quad (14)$$

$$\text{Demand:} \quad \ln Q_d = \ln\alpha_d + \eta \ln P_d - \theta_2 \ln Pop \quad (15)$$

Note that the only change in the postregulatory supply and demand equations compared to preregulatory supply and demand is the addition of the term $\epsilon \ln(1+k)$, where $k = \lambda/P_1$, to the supply equation. This term represents the unit cost of compliance under constant elasticity assumptions. Under equilibrium conditions, $Q_s = Q_d$, we can set the two equations equal to each other and rearrange terms:

$$\ln\alpha_d + \eta\ln P_2 + \theta_2\ln Pop = \ln\alpha_s + \epsilon\ln P_2 - \epsilon\ln(1+k) + \theta_1\ln PPI \quad \textbf{(16)}$$

This equation can be then written algebraically as:

$$(\eta-\epsilon)\ln P_2 = \ln\alpha_s - \ln\alpha_d + \theta_1\ln PPI - \theta_2\ln Pop - \epsilon\ln(1+k) \quad \textbf{(17)}$$

which further can be written as:

$$\ln P_2 = (\eta-\epsilon)^{-1}\,[\ln\alpha_s - \ln\alpha_d + \theta_1\ln PPI - \theta_2\ln Pop - \epsilon\ln(1+k)] \quad \textbf{(18)}$$

where P_2 is the new equilibrium market price. EPA uses this equation to calculate P_2.

To determine postregulatory supply, the same equations are used, but are solved for Q_2. Solving for Q_2 using the above equations leads to:

$$\ln Q_2 = \ln Q_1 - \frac{\epsilon\eta}{\eta-\epsilon}\ln(1+k) \quad \textbf{(19)}$$

A.3.3 Estimating the Percentage CPT and Applying it to the Closure Model

CPT is the percentage of the incremental pollution control cost incurred by an industrial laundries facility that it can pass on to its customers in the form of higher prices. CPT is calculated as the difference between the pre- and postregulatory prices relative to the weighted average pollution control cost per unit of output. The equation is as follows:

$$CPT = \frac{P_2 - P_1}{\lambda} \qquad \textbf{(20)}$$

where P_2 is calculated using the elasticities of supply and demand.

The percentage of the incremental pollution control costs incurred by each facility is calculated by multiplying the facility pollution control costs by the complement of CPT, (1 - CPT). This modified estimate of the control costs for each facility is used in the facility and firm closure models to predict the number of facilities and firms that will close as a result of the IL Standards.

A.4 MARKET MODEL RESULTS

This section presents the results of both the pre- and postregulatory market model analyses. Section A.4.1 discusses the preregulatory results, including the estimated preregulatory supply and demand equations and the supply and demand elasticities for the industrial laundries industry. Section A.4.2 presents the postregulatory market model results. These include the estimated shift in the supply curve due to the incremental pollution control costs, the postregulatory price and quantity, and the percentage CPT that is subsequently used in the facility and firm closure models.

A.4.1 Preregulatory Market Results

The preregulatory supply and demand equations were econometrically estimated using the procedures described above. The parameter estimates and regression statistics for both equations are reported in Table A-2.

EPA's contention that the supply and demand equations used are a good approximation of the actual market is supported by a variety of statistics. Of particular note are the probablities, which indicate the estimate for price is just barely outside the 90th percent confidence interval. The low standard errors for both parameter estimates and the overall model indicate that each variable used in this model (i.e.,

Table A-2

Preregulatory Supply And Demand Curve Regression Results

SUPPLY CURVE				
Parameter	**Value**	**Std. Error**	**t-stat**	**Probability**
Intercept	27.81	0.345	80.64	0.000
Price	0.277	0.067	4.12	0.001
PPI	-0.280	0.131	2.14	0.052
Model Statistics				
Sum of Squared Residuals	0.010			
Standard Error	0.027			
Adjusted R-Squared	0.707			
F-Statistic (p = 0.0001)	19.104			
Durbin-Watson Statistic	1.938			
DEMAND CURVE				
Parameter	**Value**	**Std. Error**	**t-stat**	**Probability**
Intercept	-58.38	40.028	1.459	0.168
Price	-0.593	0.346	1.715	0.110
Pop	4.585	2.147	2.136	0.052
Model Statistics				
Sum of Squared Residuals	0.010			
Standard Error	0.027			
Adjusted R-Squared	0.707			
F-Statistic (p = 0.0001)	19.104			
Durbin-Watson Statistic	1.938			

Source: U.S. EPA, 1997. Industrial Laundries Market Model. Model and data are included in the Rulemaking Record for this proposed rule.

industrial laundering output, market prices, PPI, and U.S. population levels) are significant in estimating the relationship between supply and demand in the industrial laundries market. Durbin-Watson statistics of 1.938 for both the supply and demand equations indicate that no serial correlation exists in the error terms, that is, these equations provide unbiased estimates of supply and demand. An F-statistic of 19.104 indicates that the independent variables as a group contribute significantly to the prediction of quantity supplied and quantity demanded. An adjusted R-squared statistic of 0.707 indicates that 71 percent of the variance in quantity supplied and quantity demanded is explained by the variance in the independent variables used in the equations.

Using the equations for preregulatory supply and demand presented as Equations 1 and 2 in this Appendix, the parameter estimates presented in Table A-2, and the 1993 values for market price, quantity demanded, PPI, and U.S. population presented in Table A-1, the estimated supply and demand equation can be written as:

Preregulatory Supply

$$\ln Q_s = 24.243 + 0.277 \ln P_t - 0.280 \ln PPI_t \qquad \textbf{(21)}$$

Preregulatory Demand

$$\ln Q_d = -66.04 - 0.593 \ln P_t + 4.585 \ln Pop_t \qquad \textbf{(22)}$$

The constants shown in both equations are not those shown in the regression results; instead, EPA calculated these constants based on the parameter estimates and the 1993 values for the model variables. This modification enables the estimated supply and demand curves to pass through the 1993 market equilibrium point. Figure A-2 plots the preregulatory supply and demand equations and the preregulatory equilibrium price and quantity. The regression equations shown above provide estimates of the elasticities of supply and demand for the industrial laundries market. The price elasticity of supply is the first partial derivative of the log-linear supply equation with respect to price, or 0.277. The interpretation of this

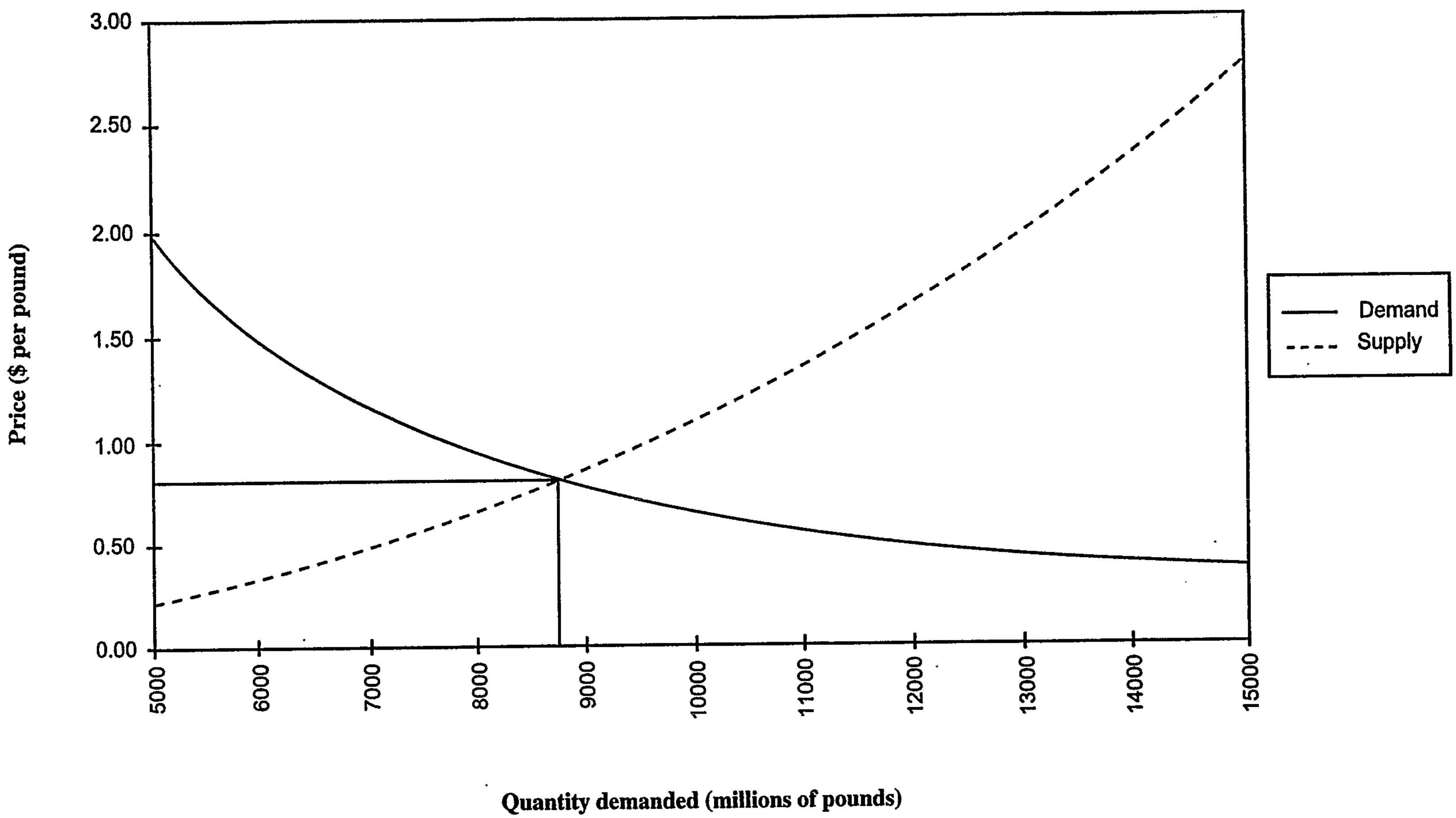

Figure A-2. Industrial laundries industry preregulatory supply and demand curves.

o:s/g/econ/8297/chart.eps

estimate is that the quantity supplied of industrial laundering services will increase by 0.277 percent in response to a 1 percent increase in price. Similarly, the price elasticity of demand is the first partial derivative of the log-linear demand equation with respect to price, or -0.593. The interpretation of this estimate is that the quantity demanded for industrial laundering services will decrease by -0.593 percent in response to a 1 percent increase in price.

A.4.2 Postregulatory Market Results

Using the equation derived in Section A.3, EPA can estimate the postregulatory price:

$$\ln P_2 = (\eta - \epsilon)^{-1} [\ln\alpha_s - \ln\alpha_d + \theta_1 \ln PPI - \theta_2 \ln Pop - \epsilon \ln(1+k)] \tag{23}$$

where k is λ/P_1 and λ is the unit cost of pollution control. The unit cost of pollution control (pretax) for all options ranges from \$0.007 to \$0.018 per pound. As shown in Table A-1, P_1 = \$0.81 and, from Table A-2, ϵ = 0.277 and η = -0.593 Substituting the cost of the CP option (\$0.0141) into the equation (it does not matter which cost is used to compute CPT since constant elasticity is assumed) reveals:

$$\begin{aligned} \ln P_2 &= (-0.0593 - 0.277)^{-1} \times [(24.243 + 66.04) - (0.28 \times \ln 100) \\ &\quad - (4.585 \times \ln 258{,}250{,}000) - (0.277 \times \ln[1 + (0.0141/0.81)])] \\ \ln P_2 &= -0.20677 \\ P_2 &= 0.813 \end{aligned} \tag{24}$$

Then, using the CPT equation:

$$CPT = \frac{P_2 - P_1}{\lambda} \tag{25}$$

the percentage CPT for all options is found to be approximately 32 percent (see Table A-3). This percentage is applied to all options. Therefore, the factor applied to compliance costs to determine the proportion of these costs that will affect the industrial laundries firms and facilities is 68 percent (1 - CPT).

Table A-3

Computation of Postcompliance Price, Quantity, and Percentage Cost Passthrough

Option	Pretax Cost	Cost per Pound	Postcompliance Price	Percentage CPT	Postcompliance Quantity Reduction
OC	$59,652,615	$0.0068	$0.811	31.75%	13,849,246
CP	$124,113,472	$0.0141	$0.813	31.65%	28,661,377
COMBO	$132,039,417	$0.0150	$0.814	31.64%	30,471,784
DAF	$160,535,980	$0.0183	$0.815	31.60%	36,961,396

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model; U.S. EPA, 1997. Industrial Laundries Market Model. Models and data are included in the Rulemaking Record for the proposed rule.

Note that prices will rise \$0.003 per pound (from \$0.81 to \$0.813 per pound; see equation 24) under the selected option, which is an increase of only 0.4 percent. With this rise in prices, EPA predicts using the equation solving for quantity that the reductions in laundry services provided (Q_1 - Q_2) range from 13.8 million pounds (0.1 percent of Q_1) to 37 million pounds (0.4 percent of Q_1),[12] depending on option. The selected option is associated with a loss of production totaling 28.7 million pounds, or 0.3 percent of the 8.8 billion pounds of laundry processed by the industry in 1993. EPA predicts this lost production to be the upper limit of any move towards substitutes for individual laundries services (see Section Eight).

Price increases and production decreases of these magnitudes would be lost in the noise of inflation and the slight growth trend occurring in the industry, which averaged 4.2 percent per year over the 1991-1993 timeframe according to the Section 308 survey (see Section Three). Furthermore, as discussed in Section Seven, if production decreases are associated with closing facilities; some nonclosing facilities are likely to experience some production increases (assuming sufficient capacity).

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[12] Note that if no costs can be passed through (i.e., a perfectly elastic demand curve), $-\epsilon\eta/\eta-\epsilon$ in the equation solving for quantity approaches -1 and the equation becomes $\ln Q_2 = \ln Q_1 - \ln(1+K)$. Through additional substitutions, one can prove under these circumstances that the output loss becomes λQ_1, or the total cost of the regulatory option under consideration, since λ is the unit cost, (i.e., total cost/Q_1.) These equations are not reproduced here. This fact is used to develop output losses under a zero-cost passthrough assumption in Section Seven.

APPENDIX B

ADDITIONAL DISCUSSION OF ASSUMPTIONS USED OR CONSIDERED FOR USE IN THE COST ANNUALIZATION MODEL

B.1 FINANCIAL ASSUMPTIONS

The cost annualization model incorporates several financial assumptions:

- Depreciation method
- Timing between initial investment and operation
- Depreciable lifetime for equipment
- Tax shields on interest payments
- Discount rates

Each assumption, and the alternatives examined in making the assumption, is discussed in detail below.

B.1.1 Depreciation Method

The Agency examined four alternatives for depreciating capital investments:

- Modified Accelerated Cost Recovery System (MACRS)
- Straight-line depreciation
- Section 169 of the Internal Revenue Code
- Section 179 of the Internal Revenue Code

Modified Accelerated Cost Recovery System (MACRS) applies to assets put into service after December 31, 1986. MACRS involves the ability to write off greater portions of the investment in the early years. In contrast, the straight-line depreciation writes off a constant amount of the investment each year.

MACRS offers companies an advantage over the straight-line method because a company's income can be reduced under MACRS by a greater amount in the early years when the time value of money is greater. Table B-1 illustrates the effects of the difference in timing in writing off a $100,000 capital investment. The absolute amount depreciated over the 16-year period is the same—$100,000 for both depreciation methods. The sum of the tax shields is also the same for both methods—$100,000 x 40.6 percent or $40,600. The difference in timing, however, means that MACRS provides a $1,664 benefit over straight-line depreciation (i.e., the difference between the present values of the tax shields). The benefit of using MACRS is clear; MACRS is the depreciation used in the cost annualization model.

Section 169 of the Internal Revenue Code provides an option to amortize pollution control facilities over a 5-year period.[1] Under this provision, 75 percent of the investment could be rapidly amortized in a 5-year period using a straight line method. The 75 percent figure is based on the ratio of allowable lifetime (15 years) to the estimated usable lifetime (20 years) as specified in the Internal Revenue Code Section 169, Subsection (f). Although the tax provision enables the facility to expense the investment over a shorter time period, the advantage is substantially reduced because only 75 percent of the capital investment can be recovered. Tables B-2 and B-3 illustrate the differences between using the Section 169 tax provision and MACRS using hypothetical costs. The present value of the tax shield from depreciation (Column 4) increases slightly, from $23,756 (Table B-2) to $24,546 (Table B-3). Because the benefit of the provision is slight, and the facilities might not get the required certification to take advantage of it, the provision was not included in the cost annualization model. Its exclusion results in a more conservative (i.e., higher) estimate of the after-tax annualized compliance cost for the facility.

The Agency also considered the Internal Revenue Code Section 179 provision to elect to expense up to $17,500 the year the investment is placed into service.[2] The Agency assumes that this provision is applied to other investments for the business entity. Its absence in the cost annualization model may result in a slightly more conservative (i.e., higher) estimate of the after-tax annualized cost for the facility.

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[1] Research Institute of America, Inc., 1995. *The Complete Internal Revenue Code*. New York, NY: Research Institute of America, Inc. January.

[2] This assumes that the investment costs do not exceed $200,000 (*The Complete Internal Revenue Code*, Section 179(b)(2); *ibid.*).

Table B-1
Depreciation Methods
Comparison of Straight Line vs. Modified Accelerated Cost Recovery System (MACRS)

Inputs:		
Capital Cost ($):		$100,000
Discount Rate :		13.0%
Depreciable Lifetime (yrs):		15
Starting Convention:		mid-year
Marignal Tax Rates:		
	Federal	34.0%
	State	6.6%
	Overall	40.6%

	Straight-Line			MACRS		
Year	Depreciation Rate	Depreciation For Year	Tax-Shield	Depreciation Rate	Depreciation For Year	Tax-Shield
1	3.33%	$3,330	$1,352	5.00%	$5,000	$2,030
2	6.67%	$6,670	$2,708	9.50%	$9,500	$3,857
3	6.67%	$6,670	$2,708	8.55%	$8,550	$3,471
4	6.67%	$6,670	$2,708	7.70%	$7,700	$3,126
5	6.67%	$6,670	$2,708	6.93%	$6,930	$2,814
6	6.67%	$6,670	$2,708	6.23%	$6,230	$2,529
7	6.67%	$6,670	$2,708	5.90%	$5,900	$2,395
8	6.66%	$6,660	$2,704	5.90%	$5,900	$2,395
9	6.67%	$6,670	$2,708	5.91%	$5,910	$2,399
10	6.66%	$6,660	$2,704	5.90%	$5,900	$2,395
11	6.67%	$6,670	$2,708	5.91%	$5,910	$2,399
12	6.66%	$6,660	$2,704	5.90%	$5,900	$2,395
13	6.67%	$6,670	$2,708	5.91%	$5,910	$2,399
14	6.66%	$6,660	$2,704	5.90%	$5,900	$2,395
15	6.67%	$6,670	$2,708	5.91%	$5,910	$2,399
16	3.33%	$3,330	$1,352	2.95%	$2,950	$1,198
Sum	100.00%	$100,000	$40,600	100.00%	$100,000	$40,600
Present Value		$45,888	$18,630		$49,987	$20,295
Net Benefit of Using MACRS over Straight-Line Method (Year 1 dollars)						$1,664

Source: See text.

Table B-2
Spreadsheet for Annualizing Costs

INPUTS

Survey ID #:	1234
Option Number:	
Initial Capital Cost ($):	$100,000
Annual Operation & Maintenance Cost ($):	$10,000
Facility-Specific Nominal Discount/Interest Rate:	13.0%
Expected Inflation Rate:	3.6%
Real Discount Rate:	9.1%
Corporate Tax Structure	1
Taxable Income ($)	$400,000
Marginal Income Tax Rates:	
Federal	34.0%
State	6.60%
Combined	40.60%

Column 1 Year	2 Depreciation Rate	3 Depreciation For Year	4 Tax Shield From Depreciation	5 O&M Cost	6 O&M Tax Shield	7 Cash Outflow	8 Cash Outflow After Tax Shields
1	5.00%	$5,000	$2,030	$5,000	$2,030	$105,000	$100,940
2	9.50%	$9,500	$3,857	$10,000	$4,060	$10,000	$2,083
3	8.55%	$8,550	$3,471	$10,000	$4,060	$10,000	$2,469
4	7.70%	$7,700	$3,126	$10,000	$4,060	$10,000	$2,814
5	6.93%	$6,930	$2,814	$10,000	$4,060	$10,000	$3,126
6	6.23%	$6,230	$2,529	$10,000	$4,060	$10,000	$3,411
7	5.90%	$5,900	$2,395	$10,000	$4,060	$10,000	$3,545
8	5.90%	$5,900	$2,395	$10,000	$4,060	$10,000	$3,545
9	5.91%	$5,910	$2,399	$10,000	$4,060	$10,000	$3,541
10	5.90%	$5,900	$2,395	$10,000	$4,060	$10,000	$3,545
11	5.91%	$5,910	$2,399	$10,000	$4,060	$10,000	$3,541
12	5.90%	$5,900	$2,395	$10,000	$4,060	$10,000	$3,545
13	5.91%	$5,910	$2,399	$10,000	$4,060	$10,000	$3,541
14	5.90%	$5,900	$2,395	$10,000	$4,060	$10,000	$3,545
15	5.91%	$5,910	$2,399	$10,000	$4,060	$10,000	$3,541
16	2.95%	$2,950	$1,198	$5,000	$2,030	$5,000	$1,772
Sum	100.00%	$100,000	$40,600	$150,000	$60,900	$250,000	$148,500
Present Value		$59,423	$24,126	$83,900	$34,063	$183,900	$125,711

	After Tax Shield	Before Tax Shield
Present Value of Incremental Costs:	$125,711	$183,900
Annualized Cost:	$15,192	$22,223

Notes: This spreadsheet assumes that a modified accelerated cost recovery system (MACRS) is used to depreciate capital expenditures.
Depreciation rates are from 1995 U.S. Master Tax Guide for 15-year property and mid-year convention.
Corporate Tax Structure: 1 = corporate tax rate 2 = individual tax rate.
If the company-specific discount rate is <3% or >19%, then the industry average figure of 10.0% is used.
First Year is not discounted.

Source: See text.

Table B-3
Spreadsheet for Annualizing Costs Using Section 169 Provision

INPUTS	
Survey ID #:	XXXX
Option Number:	
Initial Capital Cost ($):	$100,000
Annual Operation & Maintenance Cost ($):	$10,000
Facility-Specific Nominal Discount/Interest Rate:	13.0%
Expected Inflation Rate:	3.6%
Real Discount Rate:	9.1%
Corporate Tax Structure	1
Taxable Income ($)	$400,000
Marginal Income Tax Rates:	
Federal	34.0%
State	6.60%
Combined	40.60%

Column 1 Year	2 Depreciation Rate	3 Depreciation For Year	4 Tax Shield From Depreciation	5 O&M Cost	6 O&M Tax Shield	7 Cash Outflow	8 Cash Outflow After Tax Shields
1	10.00%	$7,500	$3,045	$5,000	$2,030	$105,000	$99,925
2	20.00%	$15,000	$6,090	$10,000	$4,060	$10,000	($150
3	20.00%	$15,000	$6,090	$10,000	$4,060	$10,000	($150
4	20.00%	$15,000	$6,090	$10,000	$4,060	$10,000	($150
5	20.00%	$15,000	$6,090	$10,000	$4,060	$10,000	($150
6	10.00%	$7,500	$3,045	$10,000	$4,060	$10,000	$2,895
7	0.00%	$0	$0	$10,000	$4,060	$10,000	$5,940
8	0.00%	$0	$0	$10,000	$4,060	$10,000	$5,940
9	0.00%	$0	$0	$10,000	$4,060	$10,000	$5,940
10	0.00%	$0	$0	$10,000	$4,060	$10,000	$5,940
11	0.00%	$0	$0	$10,000	$4,060	$10,000	$5,940
12	0.00%	$0	$0	$10,000	$4,060	$10,000	$5,940
13	0.00%	$0	$0	$10,000	$4,060	$10,000	$5,940
14	0.00%	$0	$0	$10,000	$4,060	$10,000	$5,940
15	0.00%	$0	$0	$10,000	$4,060	$10,000	$5,940
16	0.00%	$0	$0	$5,000	$2,030	$5,000	$2,970
Sum	100.00%	$75,000	$30,450	$150,000	$60,900	$250,000	$158,650
Present Value		$60,876	$24,716	$83,900	$34,063	$183,900	$125,121

	After Tax Shield	Before Tax Shield
Present Value of Incremental Costs:	$125,121	$183,900
Annualized Cost:	$15,120	$22,223

Notes: This spreadsheet assumes that Internal Revenue Code Section 169 is used to depreciate capital expenditures.
Corporate Tax Structure: 1= corporate tax rate 2 = individual tax rate.
If the company-specific discount rate is <3% or >19%, then the industry average figure of 10.0% is used.
First Year is not discounted.

Source: See text.

B.1.2 Timing Between Initial Investment and Operation

A business cannot begin to depreciate a capital investment before it goes into operation. The mid-year convention may be used for equipment that is placed in service at any point within the year.[3] The Agency chose to use a mid-year convention in the cost annualization model because of its flexibility and the likelihood that the equipment considered for pollution control could be built and installed within a year of initial investment. Because a half-year of depreciation is taken in the first year, a half-year is taken in the 16th year of operation. This results in the cost annualization model spanning a 16-year time period (see Table B-2).

B.1.3 Depreciable Lifetime for the Equipment

An asset's depreciable life can differ from its actual service lifetime. The Internal Revenue Code Section 168 classifies an investment as 15-year property if it has a class life of 20 years or more but less than 25 years. Section 168(e)(3)(E) lists a municipal wastewater treatment plant as an example of 15-year property.[4] Fifteen years is also the most commonly listed depreciable lifetime for wastewater treatment equipment in the 1994 Questionnaire. The cost annualization model, therefore, incorporates a 15-year lifetime. EPA investigated the use of a 7-year depreciable life, as well as a 7-year actual life.[5] Only a change in the assumption of actual life has any noticeable effect on annual cost. It is unlikely, however, that the actual life of pollution control equipment is less than 15 years.

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[3] Commerce Clearinghouse (CCH), Inc. 1994. *1995 U.S. Master Tax Guide*. Chicago, IL: CCH.

[4] Research Institute of America, 1995. *Op. cit.*

[5] Jeff Cotter and Anne Jones, ERG, 1997. "Sensitivity analysis of annualized cost estimates to changes in depreciation and project lifetime." Memorandum to Sue Burris, EPA, October 27.

B.1.4 Tax Shields on Interest Payments

The cost annualization model does not consider tax shields on interest paid to finance new pollution control equipment. A facility could finance the investment through a bank loan (debt), money from working capital, issuance of a corporate bond, or selling additional stock (equity shares). In any case, the cost annualization model assumes a cost to the facility to use the money (the discount/interest rate), whether the money is paid as interest or is the opportunity cost of internal funding. According to current tax law, if a facility finances the investment using debt, the associated interest expenses can be deducted, thereby reducing taxable income.[6] The tax shield on the interest payments, therefore, would reduce the after-tax annualized cost. It is not known what mix of debt and capital a facility will use to finance the cost of pollution control equipment. According to Table B-4, which illustrates the effects of 100-percent debt financing, the after-tax annualized cost would drop by approximately 3 percent due to tax shields on the interest payments. If the facility financed the entire investment out of working capital, there would be no associated tax benefit and the after-tax cost should be calculated without interest tax shields. To maintain a conservative estimate of the after-tax annualized cost, tax shields on interest payments are not included in the cost annualization model.

B.1.5 Discount Rates

A company can use internal financing, external financing, or some combination to raise the capital for upgrading its wastewater treatment system. Retained earnings and working capital are examples of internal funding sources. Debt and external equity (stock issuance) are examples of external funding sources. The respondents supplied their discount rate (defined as the weighted average marginal cost of capital given their mix of debt and equity) in the Section 308 Survey.

In theory, a company can raise capital up to its *retained earnings breakpoint*—the point at which its capital structure changes. The break occurs when new stock must be issued. Flotation costs associated with the new issue lead to a higher component cost which, in turn, leads to a higher discount rate.[7]

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[6]CCH, 1994, *op. cit.*

[7] Brigham, E.F., and L.C. Gapenski, 1997. *Financial Management Theory and Practice.* Chicago: The Dryden Press, 8th edition.

Table B-4
Spreadsheet for Annualizing Costs with Interest Payments

INPUTS	
Survey ID #:	XXXX
Option Number:	
Initial Capital Cost ($):	$100,000
Annual Operation & Maintenance Cost ($):	$10,000
Facility-Specific Nominal Discount/Interest Rate:	13.0%
Expected Inflation Rate:	3.6%
Real Discount Rate:	9.1%
Corporate Tax Structure	1
Taxable Income ($)	$400,000
Marginal Income Tax Rates:	
Federal	34.0%
State	6.60%
Combined	40.60%

Column 1 Year	2 Depreciation Rate	3 Depreciation For Year	4 Tax Shield From Depreciation	5 O&M Cost	6 O&M Tax Shield	7 Cash Outflow	8 Cash Outflow After Tax Shields	9 Interest Payments	10 Interest Payment Tax Shield
1	5.00%	$5,000	$2,030	$5,000	$2,030	$105,000	$100,940	$1,096	$445
2	9.50%	$9,500	$3,857	$10,000	$4,060	$10,000	$2,083	$1,096	$445
3	8.55%	$8,550	$3,471	$10,000	$4,060	$10,000	$2,469	$1,096	$445
4	7.70%	$7,700	$3,126	$10,000	$4,060	$10,000	$2,814	$1,096	$445
5	6.93%	$6,930	$2,814	$10,000	$4,060	$10,000	$3,126	$1,096	$445
6	6.23%	$6,230	$2,529	$10,000	$4,060	$10,000	$3,411	$1,096	$445
7	5.90%	$5,900	$2,395	$10,000	$4,060	$10,000	$3,545	$1,096	$445
8	5.90%	$5,900	$2,395	$10,000	$4,060	$10,000	$3,545	$1,096	$445
9	5.91%	$5,910	$2,399	$10,000	$4,060	$10,000	$3,541	$1,096	$445
10	5.90%	$5,900	$2,395	$10,000	$4,060	$10,000	$3,545	$1,096	$445
11	5.91%	$5,910	$2,399	$10,000	$4,060	$10,000	$3,541	$1,096	$445
12	5.90%	$5,900	$2,395	$10,000	$4,060	$10,000	$3,545	$1,096	$445
13	5.91%	$5,910	$2,399	$10,000	$4,060	$10,000	$3,541	$1,096	$445
14	5.90%	$5,900	$2,395	$10,000	$4,060	$10,000	$3,545	$1,096	$445
15	5.91%	$5,910	$2,399	$10,000	$4,060	$10,000	$3,541	$1,096	$445
16	2.95%	$2,950	$1,198	$5,000	$2,030	$5,000	$1,772	$1,096	$445
Sum	100.00%	$100,000	$40,600	$150,000	$60,900	$250,000	$148,500	$17,544	$7,123
Present Value		$59,423	$24,126	$83,900	$34,063	$183,900	$125,711	$9,897	$4,018

	After Tax Shield	Before Tax Shield
Present Value of Incremental Costs:	$125,711	$183,900
Annualized Cost:	$15,192	$22,223
Annualized Interest Tax Shield:	$486	
Annualized Cost After Interest Tax Shield:	$14,706	

Notes: This spreadsheet assumes that a modified accelerated cost recovery system (MACRS) is used to depreciate capital expenditures.
Depreciation rates are from 1995 U.S. Master Tax Guide for 15-year property and mid-year convention.
Corporate Tax Structure: 1= corporate tax rate 2 = individual tax rate.
If the company-specific discount rate is <3% or >19%, then the industry average figure of 10.0% is used.
First Year is not discounted.

Source: See text.

In practice, however, issuing new stock is an option restricted to publicly traded companies. The Section 308 Survey did not ask the respondent to identify whether it is publicly or privately held. However, given the number of S corps and other noncorporate structure arrangements (approximately 42 percent of surveyed firms), given the tendency of these types of firms to be privately held, and given that standard corporations also often are privately held, a substantial proportion of the industry might be privately held. In other words, determining whether the cost of the regulation results in higher discount rates does not seem to be appropriate for a likely majority of the regulated community.

The Agency uses the discount rate provided by the facility, where possible (see Section Four for a discussion of how all facilities were assigned a discount rate), in the cost annualization model. This approach generates the appropriate annualized cost if the capital needed for the pollution control upgrades is raised by:

- internal funding only.
- a mix of internal funding, debt, and equity as long as the mix reflects the capital structure used to calculate the discount rate.
- a mix of debt and equity as long as the mix reflects the capital structure used to calculate the discount rate.

This approach should not underestimate industry compliance costs or impacts.

B.3 AVERAGE STATE TAX RATE

Table B-5 lists each state's top corporate and individual tax rates and calculates national average state tax rates.[8] The cost annualization model uses the average state tax rate because of the complexities in the industry; for example, a facility could be located in one state, while its corporate headquarters are located in a second state. Given the uncertainty over which state tax rate applies to a given facility's revenues the average state tax rate is used in the cost annualization model for all facilities.

[8] CCH, 1994. *State Tax Handbook*. Chicago, IL: CCH.

Table B-5
State Income Tax Rates

State	Corporate Income Tax Rate	Basis for States With Graduated Tax Tables	Personal Income Tax Upper Rate	Basis for States With Graduated Tax Tables
Alabama	5.00%		5.00%	$3,000+
Alaska	9.40%	$90,000+	0.00%	
Arizona	9.00%		6.90%	$150,000+
Arkansas	6.50%	$100,000+	7.00%	$25,000+
California	9.30%		11.00%	$215,000+
Colorado	5.00%		5.00%	
Connecticut	11.50%		4.50%	
Delaware	8.70%		7.70%	$40,000+
Florida	5.50%		0.00%	
Georgia	6.00%		6.00%	$7,000+
Hawaii	6.40%	$100,000+	10.00%	$21,000+
Idaho	8.00%		8.20%	$20,000+
Illinois	4.80%		3.00%	
Indiana	3.40%		3.40%	
Iowa	12.00%	$250,000+	9.98%	$47,000+
Kansas	4.00%	$50,000+	7.75%	$30,000+
Kentucky	8.25%	$250,000+	6.00%	$8,000+
Louisiana	8.00%	$200,000+	6.00%	$50,000+
Maine	8.93%	$250,000+	8.50%	$33,000+
Maryland	7.00%		6.00%	$100,000+
Massachusetts	9.50%		5.95%	
Michigan	2.30%		4.40%	
Minnesota	9.80%		8.50%	$50,000+
Mississippi	5.00%	$10,000+	5.00%	$10,000+
Missouri	6.25%		6.00%	$9,000+
Montana	6.75%		11.00%	$63,000+
Nebraska	7.81%	$50,000+	6.99%	$27,000+
Nevada	0.00%		0.00%	
New Hampshire	7.00%		0.00%	
New Jersey	7.25%		6.65%	$75,000+
New Mexico	7.60%	$1Million+	8.50%	$42,000+
New York	9.00%		7.88%	$13,000+
North Carolina	7.75%		7.75%	$60,000+
North Dakota	10.50%	$50,000+	12.00%	$50,000+
Ohio	8.90%	Based on Stock Value	7.50%	$200,000+
Oklahoma	6.00%		7.00%	$10,000+
Oregon	6.60%		9.00%	$5,000+
Pennsylvania	9.90%	1997 and thereafter	2.80%	
Rhode Island *	9.00%		10.40%	$250,000+
South Carolina	5.00%		7.00%	$11,000+
South Dakota	0.00%		0.00%	
Tennessee	6.00%		0.00%	
Texas	0.00%		0.00%	
Utah	5.00%		7.20%	$4,000+
Vermont *	8.25%	$250,000+	9.45%	$250,000+
Virginia	6.00%		5.75%	$17,000+
Washington	0.00%		0.00%	
West Virginia	9.00%		6.50%	$60,000+
Wisconsin	7.90%		6.93%	$20,000+
Wyoming	0.00%		0.00%	
Average:	6.61%		5.84%	

Notes: Basis for rates is reported to nearest $1,000.
Personal income tax rates for Rhode Island and Vermont based on federal tax (not taxable income).
Tax rates given here are equivalents for highest personal federal tax rate.

Source: Personal communication, Maureen Kaplan, ERG, and Commerce Clearinghouse (CCH) Inc., to resolve discrepancies on tax rate for Missouri and Rhode Island, March 30, 1995

CCH, 1994. State Tax Handbook. Chicago, IL: CCH.

B.4 COST ANNUALIZATION MODEL AND TOTAL COST ASSESSMENT

The Total Cost Assessment (TCA) approach for evaluating pollution prevention alternatives is comprehensive financial analysis of the life-cycle costs and savings of a pollution prevention project.[9] A TCA approach includes:

- Internal allocation of environmental costs to product lines or processes through full cost accounting.
- Financial analysis of direct and indirect costs, short- and long-term costs, liability costs, and less tangible benefits of an investment.
- Evaluation of project costs and savings over a long-time horizon, e.g., 10 to 15 years.
- Measures of profitability that capture the long-term profitability of the project, e.g., net present value and internal rate of return.

TCA approaches are being developed as alternatives to traditional financial analysis methods to capture and properly evaluate the long-term costs and savings inherent in pollution prevention activities.

The cost annualization model incorporates several features of a total cost assessment analysis, including:

- Long-time horizon (the annualization model uses a 15-year time frame).
- Short- and long-term costs.
- Cost savings due to reduced chemical usage, etc., which are included in the cost estimates prepared by the EPA engineers (see Development Document).
- Depreciation, taxes, inflation, and discount rate.
- The associated closure analysis (Section Five), which uses the net present value of the investment calculated in the cost annualization model to evaluate the long-term impacts on profitability.

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[9] U.S. EPA, 1992. *Total Cost Assessment: Accelerating Industrial Pollution Prevention Through Innovative Project Financial Analysis*. Washington, D.C.: U.S. EPA, Office of Pollution Prevention and Toxics.

The economic analysis differs from the TCA approach in that it does not include a "liability avoided" component or an evaluation of the less tangible benefits of the regulation. There are insufficient data to estimate potential future liability costs for each facility. The exclusion of this parameter results in a more conservative analysis where potential impacts are not offset by avoiding future liability costs. A separate analysis and report compare the costs and benefits of the regulation.

APPENDIX C

RESULTS OF THE BASELINE CLOSURE ANALYSIS ASSUMING SALVAGE VALUE PLAYS A ROLE IN CLOSURE DECISIONS

Facility impacts under the salvage value scenario are estimated by comparing each facility's salvage value to the present value of its future earnings. The salvage value represents the expected amount of cash the owner would receive if the facility were closed and liquidated. In the baseline salvage value scenario analysis, the basic model calculates the present value of the earnings stream over a 16-year time frame and subtracts that present value from the calculated salvage value. If salvage value exceeds the present value of cash flow, the model classifies the facility as a "closure" in the baseline.

EPA assumed that if firms go out of business or close a facility, they will move quickly to liquidate their fixed assets and that, as a result, they will receive only a small fraction of the market value for their fixed assets. In the original model specifications, a 20-percent recovery factor is applied to facilities' actual or estimated value for fixed assets. Like fixed assets, the valuation of current assets when estimating salvage value is based on their probable value during an auction/liquidation process. However, unlike fixed assets, current assets are assumed to be relatively easy to liquidate. Given this, it is assumed that a firm could recover close to the full value of its current assets and, as a result, in the original model we use a one hundred percent recovery factor for current assets. Inventories also are assumed to be liquidated at a 100 percent of cost or fair market value, whichever is lower. The 20 percent fixed asset recovery factor and the 100 percent current asset recovery factor have been used in previous Office of Water EIAs.[1]

Table C-1 presents the results of the baseline closure analysis using salvage value as a determinant in the closure. This table indicates that there are a much larger number of baseline closures under the salvage value analysis than under the cash flow-only scenario shown in Section Five, Table 5-1, particularly among the nonindependent facilities, among which 36.6 percent of all nonindependent facilities would be estimated to close in the baseline. Among single-facility firms, 18.8 percent would be estimated to close in the baseline.

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[1] U.S. EPA, 1995. *Economic Impact Analysis of Proposed Effluent Limitations Guidelines and Standards for the Pharmaceutical Manufacturing Industry.* February 28.

Table C-1

Baseline Closure Analysis - Salvage Value Approach - All Facilities

Revenue Groups	Closures		Nonclosures		Total
	Number	Percentage of Revenue Group	Number	Percentage of Revenue Group	
Nonindependent Facilities					
Total	336	36.6%	633	69.0%	917
< $1 Million	35	49.5%	36	50.5%	71
>= $1 Million and < $3.5 Million	150	57.3%	112	42.7%	261
>= $3.5 Million and < $7 Million	136	31.5%	296	68.5%	431
>= $7 Million and < $10.5 Million	5	3.2%	152	96.8%	157
>= $10.5 Million	10	21.4%	37	78.6%	47
Single-Facility Firms					
Total	156	18.8%	771	92.8%	830
< $1 Million	81	31.8%	173	68.2%	254
>= $1 Million and < $3.5 Million	15	5.0%	279	95.0%	294
>= $3.5 Million and < $7 Million	53	18.8%	228	81.2%	280
>= $7 Million and < $10.5 Million	4	4.8%	77	95.2%	81
>= $10.5 Million	4	22.0%	14	78.0%	18

Note: Discrepancies in the number of facilities are due to rounding.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

In comparison, only 5.6 percent of nonindependent facilities were found to close in the baseline (although these were actually considered to be not self-supporting and were assessed at the firm level, as described in Section Five), and only about 11.6 percent of single-facility firms were shown to close without salvage value being considered (see Table 5-1 in Section Five of this EA).

Because of the large number of baseline closures indicated using salvage value, EPA began to consider that perhaps salvage value is not typically used by this industry in making decisions to liquidate facilities. In addition to the results of the salvage value analysis, EPA also had a number of additional reasons why using salvage value in a closure analysis might overstate baseline closures.

- The value of current assets at nonindependent facilities often cannot be determined. While total current assets are accounted for at the owner-company level, the owner company does not necessarily segment current assets by facility; therefore, using current assets to define a portion of salvage value often does not make sense at the facility level for nonindependent facilities.

- Identifying the true market value of a facility using either the value of fixed assets or assessed value (long considered a major source of concern in estimating salvage value) is a very uncertain means of determining true salvage value.

- EPA determined that the calculated salvage value was being driven by inventories and cash-on-hand (even when the liquidation value of inventories was reduced substantially). EPA thus questions whether a service industry with low levels of fixed assets is appropriately analyzed using salvage value if salvage value is being driven by these relatively more liquid assets. Furthermore, the value of these assets can be very volatile, changing dramatically from day to day in some cases.

- The salvage value analysis ignores liquidation costs (e.g., legal fees, real estate broker fees, costs of layoffs); these costs can be difficult even for the firms themselves to estimate. Because total assets can be relatively low in a service industry, however, the costs to liquidate might far outweigh the assets that might be realized in liquidation. This liquidation disincentive might be less of an issue in many manufacturing establishments where assets tend to be greater at a similar level of revenues compared to some types of service firms.

- Where little to no fixed assets exist (which is typical of many service industries), the real "selling" power of a service business is its cash flow — what its business potential looks like to prospective buyers, not what its equipment and real estate look like. Cash flow is thus likelier to be a much better indicator in a service industry of whether the operation is viable. For example, a small service firm may have little to no fixed assets — its real assets are its employees (who are not directly valued as an asset on the books), its business history, and its business prospects (i.e., its projected cash flow). If the firm happens to be holding a large amount of cash at a momentary point in time, it is doubtful that the firm would liquidate just because, for the moment, its current assets exceed its cash flow.

- Finally, and most importantly, industry consolidation is currently occurring at a rapid pace, with many larger firms purchasing smaller facilities to obtain their client bases and thus expand market share. Such consolidation does not involve business liquidation — the purchased facilities' business is not lost, just subsumed under a larger operation. In a situation like this, salvage value is not really an issue; negative cash flow might not even be a hindrance to a nonliquidation acquisition. Therefore, using salvage value might overstate closures, both in the baseline and postcompliance results. Cash flow, while not a perfect indicator, might more closely resemble liquidation decisions in a concentrating market.

APPENDIX D

RESULTS OF FACILITY CLOSURE AND FIRM FAILURE ANALYSES ASSUMING NO COST PASSTHROUGH

In Sections Five and Six, EPA analyzes postcompliance facility closures and firm failures under an assumption that a portion of the compliance costs can be passed through by industry to their customers. The results of the market analysis in Appendix A strongly support this assumption, and EPA believes that a no-cost passthrough assumption is likely to overstate impacts. However, the results of the closure analysis and firm failure analysis assuming no costs can be passed through are presented here.

Tables D-1 through D-3 present the facility closure results under a zero-cost passthrough assumption. As Table D-3 shows, the CP option would be associated with 35 closures over all facilities analyzed, compared to the 33 closures predicted using a cost passthrough assumption. Because the difference in the number of closures is so small, EPA believes that the cost passthrough assumption has little effect on the ultimate outcome of the closure analysis.

Tables D-4 through D-6 present the firm failure analysis under a zero-cost passthrough assumption Firm failures among the single-facility firms are somewhat higher (85 firms rather than the 65 firms under the cost passthrough assumption for the CP option).

Table D-1

Zero Cost Passthrough Analysis
Facility Closure Analysis - Single-Facility Firms*

Closures	OC	CP	COMBO	DAF
All facilities (N=734)				
Closures	1	33	33	59
Percentage of all facilities	0.2%	4.5%	4.5%	8.0%
Facilities with revenues less than $1 million (N=110)				
Closures	1	1	1	14
Percentage of all facilities	0.2%	0.2%	0.2%	1.9%
Percentage of revenue group	1.3%	1.3%	1.3%	12.8%
Facilities with revenues >= $1 million and < $3.5 million (N=290)				
Closures	0	1	1	14
Percentage of all facilities	0.0%	0.2%	0.2%	2.0%
Percentage of revenue group	0.0%	0.5%	0.5%	4.9%
Facilities with revenues >=$3.5 million and < $7 million (N=236)				
Closures	0	30	30	30
Percentage of all facilities	0.0%	4.1%	4.1%	4.1%
Percentage of revenue group	0.0%	12.8%	12.8%	12.8%
Facilities with revenues >=$7 million and <$10.5 million (N=81)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Facilities with revenues >=$10.5 million (N=18)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%

* Excluding baseline closures and setting regulatory costs to zero for facilities with < 1 million pounds and less than 255,000 pounds of shop towels and printer towels/rags in annual production.

Note: Discrepancies in the number of facilities are due to rounding.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

Table D-2

Zero Cost Passthrough Analysis
Facility Closure Analysis - Nonindependent Facilities*

Closures	OC	CP	COMBO	DAF
All facilities (N=866)				
Closures	5	3	3	6
Percentage of all facilities	0.5%	0.3%	0.3%	0.8%
Facilities with revenues less than $1 million (N=22)				
Closures	4	0	0	1
Percentage of all facilities	0.4%	0.0%	0.0%	0.2%
Percentage of revenue group	16.0%	0.0%	0.0%	6.3%
Facilities with revenues >= $1 million and < $3.5 million (N=253)				
Closures	0	1	1	3
Percentage of all facilities	0.0%	0.2%	0.2%	0.3%
Percentage of revenue group	0.0%	0.5%	0.5%	1.1%
Facilities with revenues >=$3.5 million and < $7 million (N=389)				
Closures	1	1	1	2
Percentage of all facilities	0.1%	0.1%	0.1%	0.3%
Percentage of revenue group	0.3%	0.3%	0.3%	0.6%
Facilities with revenues >=$7 million and <$10.5 million (N=155)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Facilities with revenues >=$10.5 million (N=47)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%

* Excluding baseline closures and setting regulatory costs to zero for facilities with < 1 million pounds and less than 255,000 pounds of shop towels and printer towels/rags in annual production.

Note: Discrepancies in the number of facilities are due to rounding.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

Table D-3

Zero Cost Passthrough Analysis
Facility Closure Analysis - All Facilities*

Closures	OC	CP	COMBO	DAF
All facilities (N=1600)				
Closures	6	35	35	65
Percentage of all facilities	0.4%	2.2%	2.2%	4.1%
Facilities with revenues less than $1 million (N=132)				
Closures	5	1	1	15
Percentage of all facilities	0.3%	0.1%	0.1%	1.0%
Percentage of revenue group	3.7%	1.0%	1.0%	11.7%
Facilities with revenues >= $1 million and < $3.5 million (N=544)				
Closures	0	3	3	17
Percentage of all facilities	0.0%	0.2%	0.2%	1.1%
Percentage of revenue group	0.0%	0.5%	0.5%	3.1%
Facilities with revenues >=$3.5 million and < $7 million (N=624)				
Closures	1	31	31	33
Percentage of all facilities	0.1%	2.0%	2.0%	2.0%
Percentage of revenue group	0.2%	5.0%	5.0%	5.2%
Facilities with revenues >=$7 million and <$10.5 million (N=235)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Facilities with revenues >=$10.5 million (N=65)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%

* Excluding baseline closures and setting regulatory costs to zero for facilities with < 1 million pounds and less than 255,000 pounds of shop towels and printer towels/rags in annual production.

Note: Discrepancies in the number of facilities are due to rounding.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

Table D-4

Zero Cost Passthrough Analysis
Firm Failure Analysis - Single-Facility Firms

Bankruptcies	OC	CP	COMBO	DAF
All single-facility firms (N=612)*				
Incremental bankruptcies	24	85	85	85
Percentage of all single-facility firms	3.9%	13.8%	13.8%	13.8%
Single-facility firms with revenues < $1 million (N=66)				
Incremental bankruptcies	22	66	66	66
Percentage of all single-facility firms	3.7%	10.8%	10.8%	10.8%
Percentage of revenue group	34.0%	100.2%	100.2%	100.2%
Single-facility firms with revenues >= $1 million and < $3.5 million (N=263)				
Incremental bankruptcies	1	0	0	0
Percentage of all single-facility firms	0.2%	0.0%	0.0%	0.0%
Percentage of revenue group	0.5%	0.0%	0.0%	0.0%
Single-facility firms with revenues >=$3.5 million and < $7 million (N=186)				
Incremental bankruptcies	0	18	18	18
Percentage of all single-facility firms	0.0%	3.0%	3.0%	3.0%
Percentage of revenue group	0.0%	9.9%	9.9%	9.9%
Single-facility firms with revenues >=$7 million and <$10.5 million (N=81)				
Incremental bankruptcies	0	0	0	0
Percentage of all single-facility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Single-facility firms with revenues >=$10.5 million (N=16)				
Incremental bankruptcies	0	0	0	0
Percentage of all single-facility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%

* Excluding baseline bankruptcies and postcompliance closures.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

Table D-5

Zero Cost Passthrough Analysis
Firm Failure Analysis - Multifacility Firms

Bankruptcies	OC	CP	COMBO	DAF
All multifacility firms (N=70)*				
Incremental bankruptcies	0	0	0	0
Percentage of all multifacility firms	0.0%	0.0%	0.0%	0.0%
Multifacility firms with revenues < $1 million (N=2)				
Incremental bankruptcies	0	0	0	0
Percentage of all multifacility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Multifacility firms with revenues >= $1 million and < $3.5 million (N=5)				
Incremental bankruptcies	0	0	0	0
Percentage of all multifacility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Multifacility firms with revenues >=$3.5 million and < $7 million (N=8)				
Incremental bankruptcies	0	0	0	0
Percentage of all multifacility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Multifacility firms with revenues >=$7 million and <$10.5 million (N=10)				
Incremental bankruptcies	0	0	0	0
Percentage of all multifacility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Multifacility firms with revenues >=$10.5 million (N=45)				
Incremental bankruptcies	0	0	0	0
Percentage of all multifacility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%

* Excluding baseline bankruptcies.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

Table D-6

Zero Cost Passthrough Analysis
Firm Failure Analysis - All Firms

Bankruptcies	OC	CP	COMBO	DAF
All firms (N=681)*				
Incremental bankruptcies	24	85	85	85
Percentage of all firms	3.5%	12.4%	12.4%	12.4%
Firms with revenues < $1 million (N=68)				
Incremental bankruptcies	22	66	66	66
Percentage of all firms	3.3%	9.7%	9.7%	9.7%
Percentage of revenue group	33.0%	97.2%	97.2%	97.2%
Firms with revenues >= $1 million and < $3.5 million (N=268)				
Incremental bankruptcies	1	0	0	0
Percentage of all firms	0.2%	0.0%	0.0%	0.0%
Percentage of revenue group	0.5%	0.0%	0.0%	0.0%
Firms with revenues >=$3.5 million and < $7 million (N=194)				
Incremental bankruptcies	0	18	18	18
Percentage of all firms	0.0%	2.7%	2.7%	2.7%
Percentage of revenue group	0.0%	9.5%	9.5%	9.5%
Firms with revenues >=$7 million and <$10.5 million (N=91)				
Incremental bankruptcies	0	0	0	0
Percentage of all firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Firms with revenues >=$10.5 million (N=61)				
Incremental bankruptcies	0	0	0	0
Percentage of all firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%

* Excluding baseline bankruptcies and postcompliance closures.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

APPENDIX E

RATIONALE FOR EPA'S EXCLUSION OF CERTAIN FACILITIES FROM REGULATORY COVERAGE

When EPA first began analyzing the economic and financial impacts of the regulation on the industrial laundries industry, the Agency segmented the industry according to revenues and looked closely at the most significant economic impact — facility closures. EPA discovered (see Tables E-1 through E-3) that one revenue group, facilities with less than $1 million a year in revenues, were incurring over half of the total regulatory impacts measured as facility closures under most of the options under consideration, even though they make up less than 10 percent of all facilities in the closure analysis. (Although facilities are not necessarily business entities, in this revenue category, most facilities are single-facility firms.) Within this revenue group, EPA determined that approximately 29 percent of these low-revenue facilities might close as a result of most of the options considered. Because of the obviously disproportionate impact on this subset of the small industrial laundries facilities, EPA investigated a variety of ways to minimize the impacts by excluding the smallest facilities (which also would exclude the smallest firms, since the two overlap extensively in this revenue group).

EPA looked at four types of exclusions: facilities with under $1 million in annual revenues, facilities with fewer than 30 employees, facilities with less than 2.65 million gallons per year in flow, and facilities processing fewer than 1 million pounds of laundry annually. These cutoffs were selected primarily on the following basis:

- The number of facilities excluded was small (EPA was concerned that if too many facilities were excluded, the exclusion could have a profound effect on the local markets in which they are located. For example, if one local market area has one excluded laundry and six nonexcluded laundries, the potential for one excluded facility to affect the local market is considerably less than if three excluded facilities and four nonexcluded laundries are located in a market area. If all three excluded facilities expand up to their production limit under the exclusion, substantially more business could be taken away from the nonexcluded businesses, due to the ability of excluded firms to maintain a lower price, than if only one facility was located in the market area.)

Table E-1

No Exclusion Analysis
Facility Closure Analysis - Single-Facility Firms*

Closures	OC	CP	COMBO	DAF
All facilities (N=734)				
Closures	30	64	64	64
Percentage of all facilities	4.0%	8.7%	8.7%	8.7%
Facilities with revenues less than $1 million (N=110)				
Closures	30	32	32	32
Percentage of all facilities	4.0%	4.4%	4.4%	4.4%
Percentage of revenue group	26.9%	29.4%	29.4%	29.4%
Facilities with revenues >= $1 million and < $3.5 million (N=290)				
Closures	0	1	1	1
Percentage of all facilities	0.0%	0.2%	0.2%	0.2%
Percentage of revenue group	0.0%	0.5%	0.5%	0.5%
Facilities with revenues >=$3.5 million and < $7 million (N=236)				
Closures	0	30	30	30
Percentage of all facilities	0.0%	4.1%	4.1%	4.1%
Percentage of revenue group	0.0%	12.8%	12.8%	12.8%
Facilities with revenues >=$7 million and <$10.5 million (N=81)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Facilities with revenues >=$10.5 million (N=18)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%

* Excluding baseline closures.

Note: Discrepancies in the number of facilities are due to rounding.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

Table E-2

No Exclusion Analysis
Facility Closure Analysis - Nonindependent Facilities*

Closures	OC	CP	COMBO	DAF
All facilities (N=866)				
Closures	3	6	6	7
Percentage of all facilities	0.3%	0.7%	0.7%	0.8%
Facilities with revenues less than $1 million (N=22)				
Closures	1	6	6	6
Percentage of all facilities	0.2%	0.7%	0.7%	0.7%
Percentage of revenue group	6.3%	26.2%	26.2%	26.2%
Facilities with revenues >= $1 million and < $3.5 million (N=253)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Facilities with revenues >=$3.5 million and < $7 million (N=389)				
Closures**	1	0	0	1
Percentage of all facilities	0.1%	0.0%	0.0%	0.1%
Percentage of revenue group	0.3%	0.0%	0.0%	0.3%
Facilities with revenues >=$7 million and <$10.5 million (N=155)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Facilities with revenues >=$10.5 million (N=47)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%

* Excluding baseline closures.

Note: Discrepancies in the number of facilities are due to rounding.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

Table E-3

No Exclusion Analysis
Facility Closure Analysis - All Facilities*

Closures	OC	CP	COMBO	DAF
All facilities (N=1600)				
Closures	32	70	70	71
Percentage of all facilities	2.0%	4.4%	4.4%	4.4%
Facilities with revenues less than $1 million (N=132)				
Closures	31	38	38	38
Percentage of all facilities	1.9%	2.4%	2.4%	2.4%
Percentage of revenue group	23.5%	28.9%	28.9%	28.9%
Facilities with revenues >= $1 million and < $3.5 million (N=544)				
Closures	0	1	1	1
Percentage of all facilities	0.0%	0.1%	0.1%	0.1%
Percentage of revenue group	0.0%	0.2%	0.2%	0.2%
Facilities with revenues >=$3.5 million and < $7 million (N=624)				
Closures**	1	30	30	31
Percentage of all facilities	0.1%	1.9%	1.9%	2.0%
Percentage of revenue group	0.2%	4.8%	4.8%	5.0%
Facilities with revenues >=$7 million and <$10.5 million (N=235)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Facilities with revenues >=$10.5 million (N=65)				
Closures	0	0	0	0
Percentage of all facilities	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%

* Excluding baseline closures.

Note: Discrepancies in the number of facilities are due to rounding.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

- The amount of pollutants in the wastestream relative to other facilities was small (EPA is now considering excluding facilities with under 1 million pounds of production only if they process fewer than 255,000 pounds of shop and printer towels/rags per year. The objective of this restriction is to avoid excluding facilities that process large volumes (up to a million pounds) of these sometimes highly contaminated items.

- The exclusion resulted in a significant reduction in the number of closures in this smallest group (that is, incrementally higher cutoffs that did not reduce closures in the smallest group were not considered viable cutoffs).

EPA eventually settled on the 1 million pound exclusion as a recommendation to management because this exclusion was effective in reducing small business impacts (see discussion below) and would be easily implemented.[1]

To identify the cutoff to use with a pounds-related exclusion, EPA, using the criteria above, determined which survey facilities were identified as potential closures and arrayed those facilities by pounds of production. A pattern was immediately obvious: most of the closures fell below the line of 1 million pounds of annual production. An exclusion would have to rise to 5 million pounds before most additional impacts would be eliminated (although this higher exclusion would have eliminated nearly all closures). Excluding facilities with up to 5 million pounds of laundry processed per year, however, would result in a substantial number of facilities excluded from regulatory requirements (1,127 facilities or nearly 65 percent of all facilities as compared to 141 facilities or 8 percent for the 1 million pound exclusion), leading to the potential for major market effects, and causing potentially significant problems for other small (but slightly larger than those excluded) laundries. Furthermore, the amount of pollutants that EPA could ensure would be removed from the wastewater would also drop substantially.

Once EPA decided to recommend a 1 million pound exclusion, the Agency investigated the types of laundry processed by the potentially excluded facilities. EPA was concerned that a small facility could increase the amount of shop and printer towels it laundered annually up to a million pounds per year and, in theory, still be excluded from the regulation (if shop and printer towels were its only laundry processed).

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[1] Exclusions based on flow, revenue, and the number of employees proved problematic due to anticipated implementation and/or enforcement difficulties. Although EPA analyzed these types of exclusions, the production basis appeared the most promising in terms of reliable and available information for the facility and the permit authority. See Small Business Advocacy Review Panel, 1997. *Final Report of the SBREFA Small Business Advocacy Review Panel on EPA's Planned Proposed Standards for the Industrial Laundries Point Source Category.* August 8.

Because shop and printer towels are considered to be the items contributing the greatest amount of pollutants to total pollutant load, an exclusion based only on total pounds might lead to a situation where far more pollutants would be released from the small excluded facilities than from an equal number of much larger facilities.

EPA undertook a similar process of looking at impacts and pounds of pollutants removed as that described above to determine an additional restriction to the 1 million pound exclusion based on number of pounds of shop and printer towels processed by the potentially excluded facilities. When EPA investigated the pounds of shop and printer towels laundered in the potential exclusion subcategory, the Agency discovered that there were several facilities that processed a substantial number of pounds of these items. However, most of these facilities would not be significantly affected (i.e., would not close) if they were subject to the rule. EPA determined that they could drop from the exclusion all surveyed facilities processing more than 255,000 pounds of shop and printer towels without changing the number of estimated closures. These facilities dropped from the exclusion are also associated with a large portion of pollutant loads among the potentially excluded facilities. Thus, the Agency used impacts to determine the cutoff point for shop and printer towels along with environmental effects. Had the Agency reduced the number of pounds to even 250,000 pounds, EPA would have predicted an additional 22 facilities might close as a result of the proposed industrial laundries standards, an impact felt to be unnecessarily severe, considering that pollutant load reductions would not be substantially affected overall.

This exclusion not only reduces the numbers of facility closures (both overall and in this smallest group), but also reduces the number of firm failures plus facility closures. As Tables E-3 through E-6 show, firm failures would total 61 instead of the 65 firm failures under the CP option reported in Section Six, Table 6-4, but this reduction occurs only because of the many more closures occurring (EPA removes postcompliance single-facility firm closures from the firm failure analysis to make the firm failure analysis incremental to, not overlapping with, the facility closure analysis). Thus total impacts measured as facility closures plus firm failures total 131 firms and facilities without the exclusion compared with 98 firms with the exclusion.

EPA, at the request of the SBREFA panel, further investigated the effect of a number of additional exclusions after indicating that the Agency was planning to propose the exclusion to include all facilities processing less than 1 million pounds of total water-washed industrial laundry and less than 255,000 pounds

Table E-4

No Exclusion Analysis
Firm Failure Analysis - Single-Facility Firms

Bankruptcies	OC	CP	COMBO	DAF
All single-facility firms (N=612)				
Incremental bankruptcies	19	61	61	63
Percentage of all single-facility firms	3.1%	10.0%	10.0%	10.2%
Single-facility firms with revenues < $1 million (N=66)				
Incremental bankruptcies	17	59	59	60
Percentage of all single-facility firms	2.7%	9.6%	9.6%	9.9%
Percentage of revenue group	25.3%	89.6%	89.6%	91.6%
Single-facility firms with revenues >= $1 million and < $3.5 million (N=263)				
Incremental bankruptcies	2	2	2	2
Percentage of all single-facility firms	0.4%	0.4%	0.4%	0.4%
Percentage of revenue group	0.8%	0.8%	0.8%	0.8%
Single-facility firms with revenues >=$3.5 million and < $7 million (N=186)				
Incremental bankruptcies	0	0	0	0
Percentage of all single-facility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Single-facility firms with revenues >=$7 million and <$10.5 million (N=81)				
Incremental bankruptcies	0	0	0	0
Percentage of all single-facility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Single-facility firms with revenues >=$10.5 million (N=16)				
Incremental bankruptcies	0	0	0	0
Percentage of all single-facility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%

* Excluding baseline bankruptcies and baseline and postcompliance closures.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

Table E-5

No Exclusion Analysis
Firm Failure Analysis - Multifacility Firms*

Bankruptcies	OC	CP	COMBO	DAF
All multifacility firms (N=70)				
Incremental bankruptcies	0	0	0	0
Percentage of all multi-facility firms	0.0%	0.0%	0.0%	0.0%
Multifacility firms with revenues < $1 million (N=2)				
Incremental bankruptcies	0	0	0	0
Percentage of all multi-facility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Multifacility firms with revenues >= $1 million and < $3.5 million (N=5)				
Incremental bankruptcies	0	0	0	0
Percentage of all multi-facility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Multifacility firms with revenues >=$3.5 million and < $7 million (N=8)				
Incremental bankruptcies	0	0	0	0
Percentage of all multi-facility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Multifacility firms with revenues >=$7 million and <$10.5 million (N=10)				
Incremental bankruptcies	0	0	0	0
Percentage of all multi-facility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Multifacility firms with revenues >=$10.5 million (N=45)				
Incremental bankruptcies	0	0	0	0
Percentage of all multi-facility firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%

* Excluding baseline bankruptcies.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

Table E-6

No Exclusion Analysis
Firm Failure Analysis - All Firms*

Bankruptcies	OC	CP	COMBO	DAF
All firms (N=681)				
Incremental bankruptcies	19	61	61	63
Percentage of all firms	2.8%	9.0%	9.0%	9.2%
Firms with revenues < $1 million (N=68)				
Incremental bankruptcies	17	59	59	60
Percentage of all firms	2.4%	8.7%	8.7%	8.9%
Percentage of revenue group	24.7%	87.4%	87.4%	89.4%
Firms with revenues >= $1 million and < $3.5 million (N=268)				
Incremental bankruptcies	2	2	2	2
Percentage of all firms	0.3%	0.3%	0.3%	0.3%
Percentage of revenue group	0.8%	0.8%	0.8%	0.8%
Firms with revenues >=$3.5 million and < $7 million (N=194)				
Incremental bankruptcies	0	0	0	0
Percentage of all firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Firms with revenues >=$7 million and <$10.5 million (N=91)				
Incremental bankruptcies	0	0	0	0
Percentage of all firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%
Firms with revenues >=$10.5 million (N=61)				
Incremental bankruptcies	0	0	0	0
Percentage of all firms	0.0%	0.0%	0.0%	0.0%
Percentage of revenue group	0.0%	0.0%	0.0%	0.0%

* Excluding baseline bankruptcies and baseline and postcompliance closures among single-facility firms.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.

of shop towels and printer towels/rags per year. The results of this analysis can be seen in Table E-7. As this table indicates, the proposed exclusion results in the fewest number of facilities excluded with a moderate level of impact and an acceptable amount of potentially removable pollutants remaining in the environment.[2]

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[2] In terms of toxic-weighted pounds—see U.S. EPA, 1997. *Cost-Effectiveness Analysis for Proposed Pretreatment Standards for Existing and New Sources for the Industrial Laundries Point Source Category*. November.

Table E-7

Analysis of Various Exclusion Cutoffs for the IL Rule (CP Option)

Exemption Cutoff	Total Annualized Posttax Cost	Number of Facilities Excluded	Total Baseline Closures Excluded	Total Baseline Closures Remaining After Exclusion	Total Compliance Closures Excluded	Total Compliance Closures Remaining After Exclusion	Pound Equivalent Removals Excluded	Pound Equivalent Removals Excluded (%)	Average Annual Cost as a Percent of Average Revenue	Average Annual Cost as a Percent of Average Pretax Profit [1] [2]
No exemptions	$90,541,023	0	0	148	0	70	0	0.0%	1.21%	11.81%
< 1,000,000 million pounds production and < 255,000 shop towel production	$84,960,887	141	40	107	37	33	9,562	2.3%	1.16%	11.15%
< 1,000,000 pounds production	$83,633,618	167	63	85	37	33	9,615	2.3%	1.15%	10.95%
0 pounds "heavy" production [3]	$82,177,016	220	24	124	7	62	644	0.2%	1.21%	11.43%
< 1,500,000 pounds production	$75,344,336	330	65	83	39	30	20,675	5.0%	1.06%	10.09%
< 50,000 pounds "heavy" production	$72,766,420	445	30	118	16	54	7,182	1.7%	1.32%	12.11%
< 2,000,000 pounds production	$68,795,168	431	98	50	39	30	33,999	8.2%	1.00%	9.54%
< 3,000,000 million pounds production and < 500,000 shop towel production	$59,603,920	612	75	72	39	30	63,547	15.2%	0.92%	9.03%
< 3,000,000 million pounds production and < 255,000 shop towel production	$59,449,297	598	75	72	39	30	63,404	15.2%	0.92%	9.10%
< 3,000,000 pounds production	$58,183,813	641	98	50	39	30	63,634	15.3%	0.91%	8.81%
< 4,000,000 million pounds production and < 500,000 shop towel production	$49,124,631	801	77	71	39	30	90,899	21.8%	0.86%	8.62%
< 4,000,000 million pounds production and < 255,000 shop towel production	$49,001,079	782	75	72	39	30	90,746	21.8%	0.85%	8.69%
< 200,000 pounds "heavy" production	$44,181,826	999	85	63	17	53	53,692	12.9%	1.11%	9.87%
< 5,000,000 million pounds production and < 255,000 shop towel production	$37,478,655	958	75	72	39	30	121,717	29.2%	0.75%	7.39%
< 5,000,000 million pounds production and < 500,000 shop towel production	$34,203,964	1,021	77	71	70	0	139,593	33.5%	0.72%	6.83%
< 5,000,000 pounds production	$32,280,216	1,127	121	27	70	0	153,977	36.9%	0.75%	7.23%
< 350,000 pounds "heavy" production	$23,266,634	1,310	88	60	39	30	138,517	33.2%	0.83%	6.86%
< $10,500,000 in revenue	$5,509,994	1,682	148	0	70	0	353,164	84.7%	0.62%	4.79%

[1] Note that pretax profit is approximated by earnings before interest and taxes (EBIT) in single-facility firms and by operating earnings in facilities owned by multifacility firms. EBIT is a standard measure of pretax profit. Operating earnings are used for facilities owned by multifacility firms since data to determine EBIT are typically not available at the facility level.

[2] Excluding facilities with negative baseline profits.

[3] "Heavy" production is production of shop towels, printer rags, mops, fender covers, and filters. All other industrial laundry items are not included in this category.

Note: Averages are calculated over those facilities remaining as nonexcluded facilities.

Source: U.S. EPA, 1997. IL Facility and Firm Financial Model, and Section 308 Survey data. Models and data are included in the Rulemaking Record for the proposed rule.