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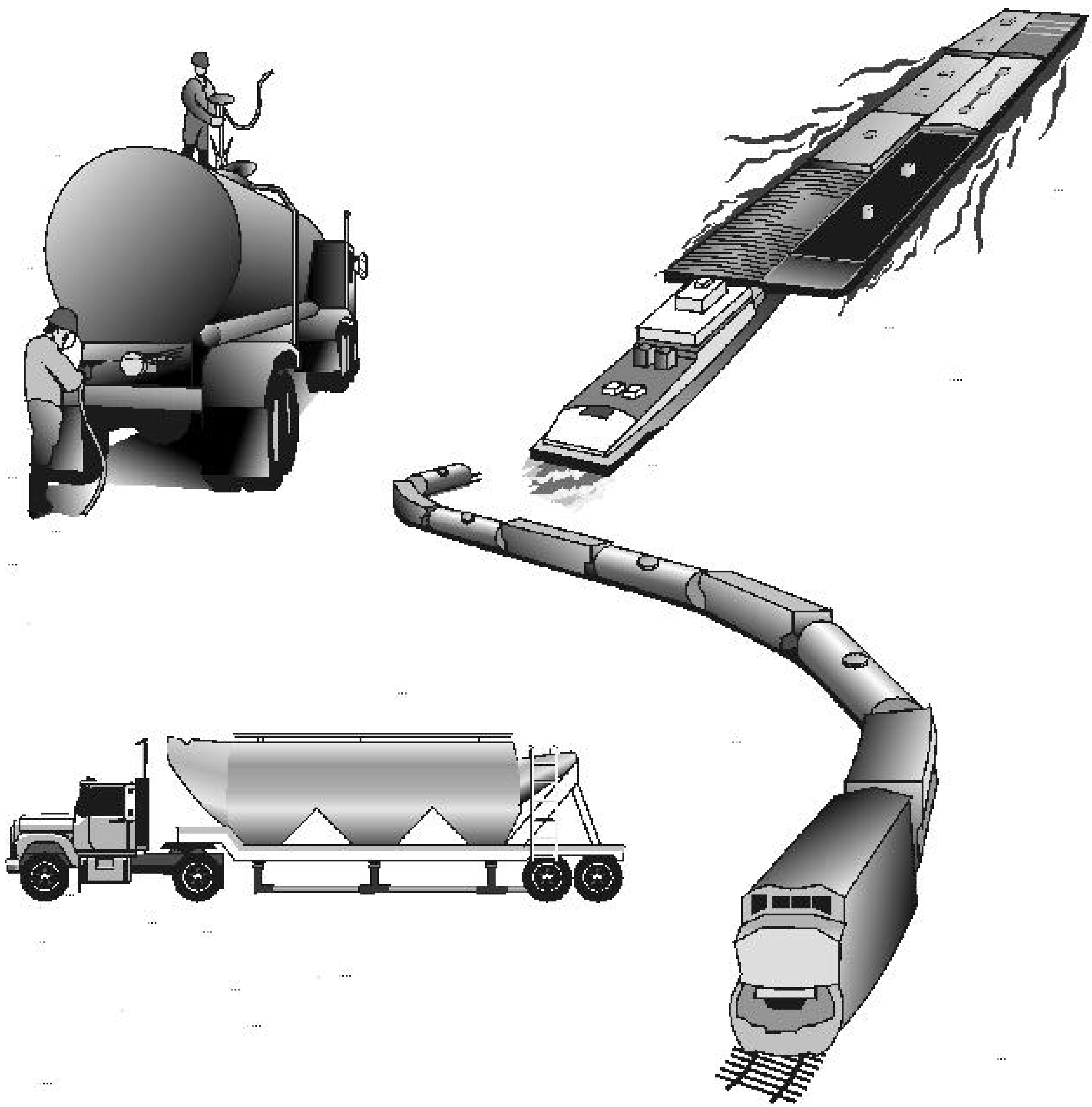
Economic Analysis Of Final Effluent Limitations Guidelines And Standards For The Transportation Equipment Cleaning Category



ECONOMIC ANALYSIS OF FINAL EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS FOR THE TRANSPORTATION EQUIPMENT CLEANING INDUSTRY POINT SOURCE CATEGORY

FINAL REPORT

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EXECUTIVE SUMMARY

ES.1 INTRODUCTION

This Economic Analysis (EA) report evaluates the costs, economic impacts, and benefits of final effluent limitations guidelines and standards (known herein as the Final Rule) that provide for pollution control requirements for the transportation equipment cleaning (TEC) industry. The TEC industry provides interior tank cleaning services to the truck, rail, and water transportation industry. These cleaning services are provided for a variety of tanks and containers, including tank trucks, closed-top hopper trucks, rail tank cars, closed-top hopper rail cars, intermodal tank containers, tank barges, closed-top hopper barges, and ocean/sea tankers.

The Final Rule includes limits for Best Practicable Control Technology (BPT), Best Conventional Pollutant Control Technology (BCT), Best Available Technology Economically Achievable (BAT), New Source Performance Standards (NSPS), and Pretreatment Standards for Existing and New Sources (PSES and PSNS). The EA estimates the impacts to the TEC industry of the Final Rule in terms of effects on market equilibrium price and the number of tank cleanings performed, facility closures and associated losses in employment, and financial distress short of closure. In addition, the EA analyzes secondary impacts on associated industries and their employment, potential barriers to new facilities entering the industry that may be caused by the regulation, and impacts on the TEC small business community.

ES.2 INDUSTRY PROFILE

ES.2.1 Data Sources

The TEC industry has the characteristic that facilities and companies in the industry represent a wide range in SIC codes yet TEC represents only a small fraction of each SIC code. Therefore, most readily-available information—such as that collected by the U.S. Department of Commerce, Bureau of the Census—does not adequately represent the TEC community affected by the guideline. The major data sources for this rulemaking are the EPA survey efforts performed under the authority of Section 308 of the Clean Water Act: the *1993 Tank and Container Cleaning Screener Questionnaire*, and the *1994 Detailed Questionnaire for the Transportation Equipment Cleaning Industry*.

ES.2.2 Industry Profile

Except for commodities transported by pipelines, all food, chemical and petroleum commodities are moved in bulk tank containers. Unless the tank is dedicated to the shipment of one product, interior tank cleaning is generally required between shipments. TEC facilities provide interior tank cleaning services to the rail, truck and water transportation industry. The TEC industry thus provides a supporting role to the nationwide flow of goods by ensuring that no contamination occurs among products from one shipment to the next.

The TEC industry was subcategorized on the basis of transportation mode and cargo carried. The commodities transported—chemicals, petroleum, food, and dry bulk materials (e.g., grain or pelletized plastic carried in closed-top hoppers)—affect the pollutants to be found in the wastewater stream and the technology appropriate to its treatment. The transportation mode affects the volume of wastewater produced per tank cleaning; rail tank cars are larger than tank trucks, and tank barges are larger than both. The volume of wastewater produced affects the concentration of pollutants in the effluent and therefore the efficiency of the treatment technologies. For the proposal, the TEC industry was divided into 11 subcategories corresponding to the three transportation modes and the four types of commodities (the Barge Chemical and Barge Petroleum subcategories were combined into one subcategory).

TEC facilities can also be subdivided into those that discharge wastewater, called potentially regulated facilities, and those that do not, called zero discharge TEC (ZDT) facilities. Potentially regulated facilities may be required under the proposed regulation to install wastewater treatment equipment, thus incurring compliance costs. ZDT facilities do not need to purchase wastewater treatment equipment under the regulation and therefore incur no compliance costs. ZDT facilities do, however, provide direct competition for affected facilities, limiting their ability to raise tank cleaning prices in response to increased costs. ZDT facilities are therefore included in the analysis in order to project market level impacts. EPA estimates there are 692 potentially affected and 537 ZDT facilities for an industry total of 1,229 TEC facilities.

During and following proposal, EPA determined that a number of the subcategories listed above either did not require regulation or could be combined into one subcategory. All the HOPPER subcategories were found to have insignificant pollutant loadings and, as proposed, will not be regulated by the Final Rule. EPA also determined that the chemical and petroleum subcategories for both truck and rail subcategories could be combined. Additionally, EPA combined all the FOOD subcategories into one subcategory.

The Agency then further divided potentially regulated facilities in each subcategory into direct and indirect dischargers. Direct dischargers discharge wastewater directly to surface water and indirect dischargers discharge wastewater to a publicly owned treatment works (POTW). EPA regulates direct and indirect dischargers differently. Best Available Technology Economically Achievable (BAT) standards set effluent limitations on toxic and nonconventional pollutants for direct dischargers prior to wastewater discharge directly into a water body such as a stream, river, lake, estuary, or ocean. Indirect dischargers send wastewater to a POTW for further treatment prior to discharge to U.S. surface waters; Pretreatment Standards for Existing Sources (PSES) set limitations for indirect dischargers on toxic and nonconventional pollutants which pass through a POTW. EPA found that nearly all surveyed facilities are indirect dischargers, with minor exceptions (primarily in the FOOD subcategories and the barge subcategory). EPA used the screener survey to provide information on some direct dischargers (see the *Economic Analysis of Proposed Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry* (U.S. EPA, 1998) for details on how the screener survey was used to provide information). While the FOOD subcategory was also divided into direct and indirect dischargers, only the direct dischargers will be covered by the Final Rule. These changes mean that the following subcategories will be regulated:

- Truck Chemical and Petroleum (TT/CHEM&PETR), both direct and indirect dischargers.
- Rail Chemical and Petroleum (RT/CHEM&PETR), both direct and indirect dischargers.
- Barge Chemical and Petroleum (TB/CHEM&PETR), both direct and indirect dischargers.
- Truck, Rail, and Barge Food (FOOD), direct dischargers only.

The remainder of this report will focus on the regulated facilities. Facilities in the HOPPER subcategory and FOOD subcategories were profiled in the proposal EA report (U.S. EPA, 1998). Because EPA made no changes to these subcategories, these subcategories will not be included in the discussions that follow except where noted. Also, generally not included is detailed information on a number of direct dischargers, totaling 23 facilities, due to data availability and data confidentiality issues, with the exception of the 10 direct discharging facilities in the TB/CHEM&PETR subcategory. These 10 facilities were captured in the Section 308 Survey detailed questionnaire. Thus, the profile focuses primarily on 368 indirect discharging facilities in the TT/CHEM&PETR, RT/CHEM&PETR, and TB/CHEM&PETR, subcategories plus 10 direct discharging TB/CHEM&PETR facilities for a total of 378 facilities. Direct dischargers in the TT/CHEM&PETR, RT/CHEM&PETR, and FOOD subcategories are assumed to be similar to indirect dischargers in those respective subcategories. Finally, note that some information on IBCs is included even though these cleanings are not regulated under the TECI Final Rule.

Two features of the TEC industry are key to understanding how the industry operates. First, the TEC industry is a service industry whose demand is derived from, or based on, the demand for transportation services. Industry output (i.e, the number of cleanings performed by the industry) is directly dependent on the demand for transportation services; as the demand for tank truck services increases, the demand for tank truck cleaning services increases. The demand for transportation services is itself linked to the demand for the commodities carried in the tank containers. The cost of TEC services is a small fraction of the cost of providing transportation services for these commodities, and there are few good substitutes for TEC services; if the tank is used to transport a commodity, its interior then needs to be cleaned. The fact that the demand for TEC services is driven by the demand for the commodities transported in the tanks that then need cleaning, and that TEC services are a small fraction of the cost of transporting those commodities means that the demand for TEC services is price inelastic. An increase in the price of TEC services will have relatively little impact on the number of tank cleanings performed.

Second, many facilities that provide TEC services do so as an adjunct to their primary operations. Facilities that manufacture commodities (shippers), provide transportation and warehouse services (carriers), and build or repair transportation equipment (builder/leasers) frequently provide their own tank cleaning services for convenience, quality control, and limits to environmental liability. Because TEC operations are part of a larger business, cleanings may be considered a cost of doing business or recorded at cost as an internal transfer of services. EPA chose to call these “in-house” facilities. The distinguishing feature of in-house facilities is that TEC is not their primary product, and TEC services generally comprise a very small share of total facility revenues, employment and cost.[1] Other facilities perform TEC operations as their primary activity for independent clients. For these facilities, the price per cleaning is a market transaction between buyer and seller. EPA chose to call these “commercial” facilities. TEC services comprise a significant share of total facility revenues, employment and cost at commercial facilities.

Overall, the 378 potentially regulated facilities profiled in this report are estimated to have earned in excess of $1.7 billion in 1994 revenues and to have employed 15,700 workers. Of these revenues, $195 million (11.4 percent) came from TEC services and 2,700 workers (17.2 percent) at TEC facilities performed tank cleaning operations. These aggregate industry statistics, however, serve to hide the great differences between in-house and commercial facilities. The 170 potentially regulated commercial TEC facilities earned an average of $2.2 million in revenues, 47 percent of which came from TEC services. The 208 potentially regulated facilities that provide in-house TEC services earned an average of $6.4 million in revenues, less than 2 percent of which came from TEC services. Thus, the TEC industry is comprised of two groups: one set of relatively large facilities whose primary interest is *not* TEC services and that perform a relatively small number of tank cleanings, and a second set of much smaller facilities whose primary interest is TEC services and that provide intensive tank cleaning operations.

ES.3 ECONOMIC IMPACT ANALYSIS METHODOLOGY OVERVIEW

EPA analyzed the potential regulatory impacts to the TEC industry on several levels. First, the cost annualization model used engineering estimates of one-time capital and annual operating and maintenance (O&M) costs to calculate the total project cost. Second, the aggregate effect of the proposed regulation on commercial tank cleaning prices and the number of tanks cleaned were analyzed in a market model. The facility closure analysis estimates each facility’s post compliance cash flow to determine if the facility will remain profitable enough after installing the wastewater treatment system for the owner to keep it open. Facilities which are projected to remain open may incur impacts that will

[1] This explains why the TEC industry is represented by a wide range of SIC codes as discussed above under *Data Sources*.

impair the long run financial health of the firm; these impacts are assessed through financial ratio analysis using the Altman Z0 model. Finally, secondary impacts on suppliers to and customers of the TEC industry are analyzed using input-output modeling techniques.

ES.3.1 Cost Annualization Model

Central to the EA is the cost annualization model, which uses facility-specific capital and O&M data (including monitoring costs, see U.S. EPA, 2000b) and other inputs to determine the annualized costs of improved wastewater treatment. This model uses these cost inputs with the facility-specific real cost of capital (discount rate) over a 16-year analytic time frame to generate the annualized cost of compliance. 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. Under each option, EPA examined if it would be less expensive for a facility to have wastewater hauled offsite than to install, operate and maintain the equipment specified for that option. The model generates the annualized cost for each option (including the cost of hauling wastewater, if that was the less expensive alternative) for each facility in the subcategory, which is then used in the facility and firm analyses. Annualized costs are also used to calculate the cost-effectiveness of treatment technologies in removing pollutants from the wastewater (U.S. EPA, 2000a).

ES.3.2 Market Model

The TEC market model uses a simultaneous equation market supply and demand model to project the impacts of the Final Rule on the price of commercial tank cleaning services and the number of tank cleanings performed. The subcategorization of the TEC industry corresponds to well defined markets for tank cleaning services based on transportation mode and commodities carried. Market supply is directly derived from detailed questionnaire survey data. Because TEC services are not an end product in themselves, but exist only to assist in the provision of transportation services, the demand for TEC services is derived from the demand for transportation services. The price elasticity of demand for TEC services is a function of the price elasticity of demand for transportation services and the cost of TEC services as a percent of the cost of transportation services. In general, derived demand is also a function of the substitutes available for that good; however, there are no good substitutes available for TEC services.

The supply curve of TEC services is shifted upwards by the average cost of compliance per tank cleaned by commercial facilities. Commercial facilities with zero wastewater discharge are included in this average. This serves to decrease the average cost of compliance per tank cleaned for the entire subcategory. The post compliance increase in equilibrium price will be lower, and potentially affected commercial facilities are able to pass on a smaller percentage of compliance costs than they would in the absence of competition from ZDT facilities. The increase in post compliance price measures the amount of increased costs passed through from the facilities to the customers. The "cost pass through" factor—an output of the market model—is an input to the facility closure model (see Section ES.3.3).

EPA also examined in the market model the decision faced by in-house facilities—(1) comply with the proposed regulation, or (2) shutdown their TEC operation and outsource their tank cleanings. This component of the model compared the post compliance cost of in-house tank cleanings with the cost of having the same tank cleanings performed commercially (including the cost of moving the tank to the nearest commercial facility) at the predicted post compliance market price. Any outsourcing by in-house facilities implies a shift in the demand curve for TEC services.

ES.3.3 Facility Closure Model

In the facility analysis, EPA models the financial impacts of regulatory costs on individual TEC facilities. EPA first forecasts the present value of baseline facility cash flow under three different scenarios. The forecasts are based on the three years of financial data for each facility in the Section 308 survey assuming no real growth.

The cost annualization model calculates the present value of posttax compliance costs over the sixteen year project life. The impact of compliance costs on cash flow is analyzed under alternative assumptions. First, EPA assumes zero compliance costs can be passed through to facility customers; all results reported in this executive summary assume zero cost pass through. Second, the present value of compliance costs is adjusted downward by the cost pass-through factor calculated from the market model. The adjusted present value of compliance costs represents the estimated change in facility cash flow caused by the proposed regulation. This is used as a sensitivity analysis to the zero cost pass through assumption.

For all subcategories except one (RT/CHEM&PETR), the estimated change in the present value of cash flow is subtracted from the projected present value of baseline facility cash flow to estimate the present value of post compliance cash flow. If the present value of post compliance cash flow is negative under two of the three forecasting methods, EPA considers the facility likely to close as a result of the regulation.

In the RT/CHEM&PETR subcategory EPA determined that it was appropriate to consider the salvage value of the facility in the closure analysis (see proposal EA report (U.S. EPA, 1998) Appendix C for details). Salvage value is estimated on two different bases: book value and market value. The post compliance cash flow for each facility is calculated as described above. Three estimates of cash flow and two estimates of salvage value provide six possible outcomes for evaluating the closure decision. If the post compliance cash flow is less than the salvage value of the facility in four out of six comparisons (i.e., the majority of the evidence), the facility is projected to close.

ES.3.4 Financial Ratio Analysis

Financial impacts short of closure may also result from the imposition of regulatory costs. The cost of complying with the regulation may cause financial instability which will make it more difficult for companies to raise capital and thus threaten their long term independent financial viability. Banks frequently use financial ratio analysis to evaluate the long term creditworthiness of potential borrowers. EPA estimates the regulatory impact on financial ratios concerning earnings, assets, liabilities, and working capital at the firm level (accounting for costs for multiple facilities, where applicable). The firm level is the appropriate level for this analysis because the firm is the entity responsible for financial decisions. These financial ratios are the components of a weighted average known as Altman's Z0, 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. Facilities owned by firms whose Altman's Z0 number changes such that the firm goes from a "good" or "indeterminate" baseline category to a "poor" post compliance 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, loss of financial independence, or other corporate distress.

ES.3.5 Secondary Impact Analysis

In the secondary analysis, EPA uses input-output analysis to examine: (1) gross and net (losses minus gains) national-level estimates of employment and output changes (gains and losses) throughout the U.S. economy in all sectors of the economy; (2) a regional impact analysis using estimates of employment and output changes to determine whether significant impacts on individual states might be experienced.

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 TEC industry on the U.S. economy as a whole. Every loss in output in the TEC 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 TEC industry alone. EPA determines these impacts at the national level based on the compliance costs of the Final Rule.

The costs of compliance, however, 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 Final Rule. EPA estimated an upper and lower bound to secondary output and employment impacts by varying certain assumptions used in the analysis.

Regional-Level Analysis

EPA also determined the impacts on regional-level employment and output. EPA conducted a regional analysis because even if employment and output losses are relatively small on a national level, they might still have a substantial negative effect on an individual region. Because no facility closures are projected under the selected options, EPA modeled regional effects by assuming that all employment and output losses estimated at the national level, but none of the offsetting gains, occur in the smallest state.

ES.4 POLLUTION CONTROL OPTIONS

EPA investigated up to three options for each subcategory. All options examined for each subcategory and the options selected for the Final Rule are listed in Table ES-1.

For TT/CHEM&PETR Direct, EPA has selected Option 2 for BPT, BCT, BAT, and NSPS. EPA has selected Option 2 for BPT, BCT, BAT, and NSPS in the RT/CHEM&PETR Direct subcategory. For the TB/CHEM&PETR Direct subcategory, EPA has selected Option 1 for BPT, BCT, BAT, and NSPS. EPA has selected Option 2 for BPT, BCT, and NSPS in the regulated FOOD subcategory (which comprises only direct dischargers); BAT is not being promulgated for the FOOD subcategory because few priority and nonconventional pollutants are either discharged or removed.

For TT/CHEM&PETR Indirect, EPA has selected Option 1 for PSES and PSNS. EPA has selected Option 2 for PSES and PSNS for RT/CHEM&PETR Indirect. For the TB/CHEM&PETR Indirect subcategory, EPA has selected Option 2 for PSES and PSNS.

ES. 5 ECONOMIC IMPACTS

This section summarizes projected impacts to subcategories for which treatment technologies are promulgated using the analytic methodologies outlined in section ES. 3.

TABLE ES-1

TECHNOLOGY OPTIONS FOR TEC INDUSTRY SUBCATEGORIES

Option	Selected Option for Final Rule	Description
TT/CHEM&PETR Direct		
1[1]		Equalization, oil/water separation, chemical oxidation, neutralization, coagulation, clarification, biological treatment, and sludge dewatering
2	BPT, BCT, BAT, NSPS	Equalization, oil/water separation, chemical oxidation, neutralization, coagulation, clarification, biological treatment, *activated carbon adsorption*, and sludge dewatering
TT/CHEM&PETR Indirect		
A		Equalization, and oil/water separation
1	PSES, PSNS	Equalization, oil/water separation, *chemical oxidation*, *neutralization*, *coagulation*, *clarification*, and *sludge dewatering*
2		Equalization, oil/water separation, chemical oxidation, neutralization, coagulation, clarification, *activated carbon adsorption*, and sludge dewatering
RT/CHEM&PETR Direct		
1		Oil/water separation, equalization, biological treatment, and sludge dewatering
2	BPT, BCT, BAT, NSPS	Oil/water separation, equalization, *dissolved air flotation (with flocculation and pH adjustment)*, biological treatment, and sludge dewatering
3		Oil/water separation, equalization, dissolved air flotation (with flocculation and pH adjustment), biological treatment, *organo-clay/activated carbon adsorption*, and sludge dewatering
RT/CHEM&PETR Indirect		
1		Oil/water separation
2	PSES, PSNS	Oil/water separation, *equalization*, *dissolved air flotation (with flocculation and pH adjustment)*, and *sludge dewatering*
3		Oil/water separation, equalization, dissolved air flotation (with flocculation and pH adjustment), *organo-clay/activated carbon adsorption*, and sludge dewatering

TABLE ES-1 (continued)

Option	Selected Option for Final Rule	Description
TB/CHEM&PETR Direct		
1	BPT, BCT, BAT, NSPS	Oil/water separation, dissolved air flotation, filter press, biological treatment, and sludge dewatering
2		Oil/water separation, dissolved air flotation, filter press, biological treatment, *reverse osmosis*, and sludge dewatering
TB/CHEM&PETR Indirect		
1		Oil/water separation, dissolved air flotation, and in-line filter press
2	PSES, PSNS	Oil/water separation, dissolved air flotation, in-line filter press, *biological treatment (with chemically assisted clarification)*, and *sludge dewatering*
3		Oil/water separation, dissolved air flotation, in-line filter press, biological treatment (with chemically assisted clarification), *reverse osmosis*, and sludge dewatering
FOOD		
1		Oil/water separation
2	BPT, BCT NSPS	Oil/water separation, *equalization*, *biological treatment*, and *sludge dewatering*

Note: EPA developed options based on incremental technology additions to a treatment train. Each option builds upor previous option. Technologies incremental to the previous option are shown in italics to help the reader identify distinguishing characteristics of an option.

[1] Option 1 has identical costs and removals as Option 2.

Individual impact results are not reported in this section for the TT/CHEM&PETR Direct, RT/CHEM&PETR Direct, and TB/CHEM&PETR Indirect because of confidential business information (CBI) disclosure issues. For indirect dischargers in the TB/CHEM&PETR subcategory, all facilities have sufficient treatment in place. Therefore these facilities only incur monitoring costs.

Results are also not reported for the FOOD subcategory. For the proposed option, EPA determined all direct discharging FOOD facilities have Option 2 treatment in place and EPA has estimated that there are no costs or impacts associated with any option for this subcategory (U.S. EPA, 1998). EPA received no comments on the proposed option and did not revise its analysis for this subcategory.

The results of the impact analysis are summarized in Table ES-2. Pretax annualized costs for the selected options total $14.6 million (1994 dollars) for indirect dischargers in the TT/CHEM&PETR and RT/CHEM&PETR subcategories, and $0.1 million for direct dischargers in the TB/CHEM&PETR subcategories. Compliance costs to nondisclose facilities add approximately $0.1 million to the total.

EPA developed a low flow exclusion for facilities discharging less than 100,000 gallons per year. Of the 322 TT/CHEM&PETR Indirects, 36 facilities are projected to not incur compliance costs because of the low flow exclusion. Similarly, 11 of 41 RT/CHEM&PETR Indirects, and three of seven TB/CHEM&PETR Directs are expected to meet the requirements of the low flow exclusion and therefore incur zero compliance costs under the Final Rule.

The market model projects the price of tank cleanings to rise by 1.8 percent in the TT/CHEM&PETR subcategory, 4.3 percent in the RT/CHEM&PETR subcategory, and less than 1 percent in the TB/CHEM&PETR subcategory. The number of tank cleanings performed is projected to decline by 0.3 percent in the TT/CHEM&PETR subcategory, and less than 1 percent in both the RT/CHEM&PETR and TB/CHEM&PETR subcategories. Because the demand for TEC services is price inelastic, the impact of the proposed regulation falls more on price than on the number of tank cleanings performed.

No closures are projected under the selected options. Incremental financial distress is incurred by the parent business entities of 14 facilities, all of which are in the TT/CHEM&PETR subcategory.

TABLE ES-2

SUMMARY OF IMPACTS UNDER SELECTED REGULATORY OPTIONS

Subcategory	Opti	Total i Class [1]	Cost Type	Cost	Impacts: Closures	Impacts: Financial Distress	Impacts: Sales Test [2]: 1 Percent Threshold	Impacts: Sales Test [2]: 3 Percent Threshold
Indirect Dischargers								
TT/CHEM&PETR [3]	Option 1	322	Capital	$51,430,699	0	14	100	65
			O&M	$8,030,113				
			Post-tax Annualized	$8,367,490				
			Pre-tax Annualized	$13,154,049				
RT/CHEM&PETR [3]	Option 2	41	Capital	$7,037,479	0	0	18	6
			O&M	$659,146				
			Post-tax Annualized	$928,086				
			Pre-tax Annualized	$1,376,703				
TB/CHEM&PETR [3]	Option 2	5	Capital	ND	0	0	ND	ND
			O&M	ND				
			Post-tax Annualized	ND				
			Pre-tax Annualized	ND				
Direct Dischargers								
TT/CHEM&PETR [4]	Option 2	3	Capital	ND	0	0	ND	ND
			O&M	ND				
			Post-tax Annualized	ND				
			Pre-tax Annualized	ND				
RT/CHEM&PETR [4]	Option 2	1	Capital	ND	0	0	ND	ND
			O&M	ND				
			Post-tax Annualized	ND				
			Pre-tax Annualized	ND				
TB/CHEM&PETR [3]	Option 1	10	Capital	$85,126	0	0	3	0
			O&M	$125,886				
			Post-tax Annualized	$81,730				
			Pre-tax Annualized	$133,610				

[1] Of this total, 36 TT/CHEM&PETR Indirects, 11 RT/CHEM&PETR Indirects, and 3 TB/CHEM&PETR Directs incurred zero compliance costs due to 100,000 gallons per year de minimis flow exclusion.
[2] Posttax annualized compliance cost/facility revenues.
[3] Based on detailed questionnaire data.
[4] Based on screener questionnaire data.
ND: Not disclosed due to business confidentiality.
Compliance costs include monthly monitoring for indirect dischargers; combination of weekly/monthly monitoring for indirect dischargers.

EPA also examined the *sales test* as an additional measure of impacts of the proposed regulation (U.S. EPA, 1997). The sales test examines the ratio of each facility's annualized compliance costs (either pre- or posttax) to their 1994 revenues. The results of the posttax sales test are included in Table ES-2. Thirty-two percent of affected facilities incur posttax annualized compliance costs that exceed 1 percent of facility revenues, and 19 percent of affected facilities incur costs exceeding 3 percent of revenues. The sales test is a less sophisticated measure of impacts than the closure model, which examines cash flow over three years, and it does not account for a facility's ability to pass compliance costs through to their customers in the form of higher prices.

EPA projects the Final Rule will cause total output losses in the U.S. economy ranging from $43.7 million to $50.0 million (0.001 percent of 1994 U.S. GDP) and employment losses ranging from 531 to 608 (0.005 percent of 1994 U.S. employment) when all secondary impacts are accounted for. However, new expenditure on wastewater control should generate new output of $25.9 million and 321 new jobs nation-wide to offset those losses. The net loss to the U.S. economy thus ranges from $17.3 million to $24.1 million in output (0.0003 percent of 1994 U.S. GDP) and 210 to 287 jobs (0.002 percent of 1994 U.S. employment).

If all projected primary and secondary output losses of $50 million—but none of the secondary output gains—occurred in the state with the smallest GDP, Vermont would lose 0.4 percent of 1994 output. Similarly, if all projected 608 primary and secondary employment losses—but none of the secondary employment gains—occurred in the state with the smallest employment, Alaska would lose approximately 0.2 percent of 1994 employment.

Another analysis EPA performs is a "barriers-to-entry" analysis to determine whether the costs of NSPS/PSNS would prevent new sources from entering the market. EPA examined the ratio of each facility's projected capital costs (to meet existing source standards) to facility assets as a proxy for the regulation's impact on the start up costs of a new facility. 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, and because EPA also has shown the selected options to be economically achievable, having an acceptable level of impact on existing sources, EPA concluded that these standards do not cause a barrier to entry for new sources.

ES.6 SMALL BUSINESS ANALYSIS

Under the Regulatory Flexibility Act (RFA) as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA), government agencies are required to analyze regulatory impacts on small entities. The RFA acknowledges that small entities have limited resources and makes it the responsibility of the regulating federal agency to avoid burdening such entities unnecessarily. *EPA is certifying that the TEC Final Rule will not have a significant impact on a substantial number of small entities*, and therefore is not required to present a final regulatory flexibility analysis under the RFA. However, EPA is responsive to the intent of the RFA and assessed the impacts of the TEC Final Rule on small business entities.

After proposal, EPA took several steps to minimize the regulatory burden associated with the rulemaking. First, EPA has developed a low flow exclusion for facilities discharging less than 100,000 gallons per year. The low flow exclusion exempts 51 total facilities, of which seven are associated with small businesses. Second, EPA also has simplified the subcategorization scheme by combining subcategories, making the rule simpler. Third, EPA's adoption of concentration-based limits rather than mass-based limits will make it easier for POTWs, including those owned by small municipalities, to calculate permit limits.

Table ES-3 summarizes projected impacts to small TEC entities. No small entities are projected to close under the selected options, nor are any small entities projected to incur financial distress. Using the sales test—the ratio of pre- or posttax annualized compliance costs to facility sales revenues—EPA found that 41 of 97 small entities incur pretax costs exceeding 1 percent of revenues, of which 35 incur costs exceeding 3 percent of revenues. Under the less conservative, but more realistic analysis using posttax costs, EPA found that 38 of the 97 small entities incur costs exceeding 1 percent of revenues, and 29 of 97 incur costs exceeding 3 percent of revenues. EPA is certifying that the proposed TEC regulation will not have a significant impact on a substantial number of small entities.

ES.7 BENEFITS METHODOLOGY

EPA evaluated water quality impacts and associated risks/benefits of TEC discharges at various treatment levels by: (1) comparing projected instream concentrations with ambient water quality criteria,

TABLE ES-3

IMPACTS UNDER SELECTED OPTIONS BY SMALL BUSINESS STATUS

					Entities with Compliance Costs Exceeding Percentage of Revenues [1]			
					Pretax Costs		Posttax Costs	
Subcategor	Business Size	Total in Class	Closures	Financial Distress	1 percent	3 percent	1 percent	3 percent
TT/CHEM&PETR [2]	Small	79	0	0	29	29	29	29
	Other	243	0	0	112	50	72	36
RT/CHEM&PETR [2]	Small	12	0	0	9	6	6	0
	Other	29	0	0	13	6	12	6
TB/CHEM&PETR [3]	Small	6	0	0	3	0	3	0
	Other	4	0	0	1	0	0	0
Total	Small	97	0	0	41	35	38	29
	Other	276	0	0	126	56	84	42

[1] Annualized cost/facility revenues assuming zero cost pass through.
[2] Indirect dischargers from detailed questionnaire database only;
results for direct dischargers from screener questionnaire database excluded from table due to confidential business information disclosure issues.
[3] Direct dischargers from detailed questionnaire database only;
results for indirect dischargers from detailed questionnaire database excluded from table due to confidential business information disclosure issues.
Entity is small business-owned if parent business entity earned less than $5 million in revenues in 1994.

(2) estimating the human health risks and benefits associated with the consumption of fish and drinking water from waterbodies impacted by the TEC industry, (3) estimating the ecological benefits associated with improved recreational fishing habitats on impacted waterbodies, and (4) estimating the economic productivity benefits based on reduced sewage sludge contamination at POTWs receiving the wastewater of TEC facilities. The Agency performed these analyses for a representative sample set of 40 indirect TT/CHEM&PETR facilities and 10 indirect RT/CHEM&PETR facilities. EPA extrapolated results to the national level based on the statistical methodology used for estimated costs, loads, and economic impacts. The methodologies used in this evaluation are described briefly below. Please see the *Environmental Assessment of the Final Effluent Guidelines for the Transportation Equipment Cleaning Industry* (U.S. EPA, 2000c) for a full description of the methodology.

ES.8 ENVIRONMENTAL ASSESSMENT AND BENEFITS ANALYSIS

ES.8.1 Overview

The environmental assessment quantifies the water quality-related benefits for TEC facilities based on site-specific analyses of current conditions and the conditions that would be achieved by process changes under proposed BAT (Best Available Technology) and PSES (Pretreatment Standards for Existing Sources) controls. For the TEC industry, the Agency estimated in-stream pollutant concentrations for 110 priority and nonconventional pollutants from two subcategories (TT/CHEM&PETR, and RT/CHEM&PETR) of indirect discharges using stream dilution modeling. EPA analyzed discharges from representative sample sets of 40 indirect TT/CHEM&PETR facilities and 10 indirect RT/CHEM&PETR. The Agency then extrapolated results to the national level, based on the statistical methodology used for estimated costs, loads, and economic impacts from discharges by 286 TT/CHEM&PETR facilities and 30 RT/CHEM&PETR facilities.

ES.8.2 Water Quality Impacts

The Agency compared projected instream concentrations with human health criteria and with ambient water quality. TT/CHEM&PETR national projections indicate that extrapolated in-stream pollutant concentrations of no pollutant will exceed human health criteria or toxic effect levels in any of the 255 receiving streams at current discharge levels. The Agency's extrapolated in-stream concentrations indicate that one pollutant will exceed chronic aquatic life criteria or toxic effect levels in seven of the 255 receiving streams at current discharge levels. The TEC effluent guidelines eliminate these excursions.

RT/CHEM&PETR national projections indicate that, at current discharge levels, in-stream concentrations of two pollutants will exceed human health criteria or toxic effect levels developed for water **and** organisms consumption in 13 of the 28 receiving streams. With the TEC effluent guidelines, the Agency projects that one pollutant will still exceed these criteria in the 13 receiving streams. EPA also projects excursions of human health criteria or toxic effect levels developed for organisms consumption **only** for one pollutant in six of the 28 receiving streams. The TEC effluent guidelines will eliminate this excursion. The Agency projects no excursions of aquatic life criteria.

ES.8.3 Human Health Risks And Benefits

EPA estimated the human health risks and benefits associated with the consumption of fish and drinking water from waterbodies impacted by the TEC industry. TT/CHEM&PETR national projections indicate that the reduction of total excess annual cancer cases due to the TEC is 1.0E-3 cancer cases. The monetary value of benefits to society from these avoided cancer cases is $2,200 to $12,000 (1994 dollars). EPA projects no excess annual cancer cases from the consumption of contaminated drinking water. EPA projects no systemic toxicant effects from exposure to contaminated fish or drinking water based on the estimated hazard calculated for each receiving stream.

RT/CHEM&PETR national projections indicate that the TEC effluent guideline will reduce total excess annual cancer cases by 2.2E-2 cancer cases. The monetary value of benefits to society from these avoided cancer cases is $48,000 to $257,000 (1994 dollars). EPA projects no excess annual cancer cases from the consumption of contaminated drinking water.   EPA projects no systemic toxicant effects from these discharges.

ES.8.4 Ecological Benefits

EPA estimated the ecological benefits associated with improved recreational fishing habitats on impacted waterbodies. TT/CHEM&PETR national projections indicate that the proposed regulation will completely eliminate in-stream concentrations in excess of AWQC at seven receiving streams. The resulting estimate of the increase in value of recreational fishing to anglers ranges from $891,000 to $3,183,000 (1994 dollars). The estimate of the nonuse (intrinsic) benefits to the general public, as a result of the same improvements in water quality, ranges from at least $445,500 to $1,591,500 (1994 dollars).

RT/CHEM&PETR national projections indicate that no recreational benefits will be generated as a result of the TEC effluent guideline for this subcategory. In addition, the Agency projects no nonuse benefits.

The estimated benefit of improved recreational fishery opportunities is only a limited measure of the value to society of the improvements in aquatic habitats expected to result from the proposed regulation. Additional benefits, which could not be quantified in this assessment, include increased assimilation capacity of the receiving stream, protection of terrestrial wildlife and birds that consume aquatic organisms, maintenance of an aesthetically pleasing environment, and improvements to other recreational activities such as swimming, water skiing, boating, and wildlife observation. Such activities contribute to the support of local and state economies.

ES.8.5 Economic Productivity Benefits

EPA estimated the economic productivity benefits based on reduced sewage sludge contamination at POTWs receiving the wastewater of TEC facilities. TT/CHEM&PETR national projections indicate no inhibition impacts at POTWs and no sludge contamination problems as a result of these discharges.

RT/CHEM&PETR national projections indicate inhibition problems at 13 of the 28 of the POTWs receiving wastewater discharges at current discharge levels. The TEC effluent guidelines will reduce projected problems to six of the 28 POTWs. Monetary values for the reduction of inhibition problems cannot currently be estimated. Results also indicate no sludge contamination problems at POTWs.

ES.8.6 Pollutant Fate And Toxicity

EPA identified 95 pollutants of concern (priority, nonconventional, and conventional) in waste streams from TT/CHEM&PETR facilities. Most of these have at least one known toxic effect. Based on available physical-chemical properties and aquatic life and human health toxicity data for these pollutants, 19 exhibit moderate to high toxicity to aquatic life; 57 are human systemic toxicants; 19 are classified as known or probable carcinogens; 32 have drinking water values; and 26 are designated by EPA as priority pollutants. In terms of projected environmental partitioning among media, 29 of the evaluated pollutants are moderately to highly volatile; 36 have a moderate to high potential to bioaccumulate in aquatic biota; 22 are moderately to highly adsorptive to solids; and 19 are resistant to biodegradation, or are slowly biodegraded.

EPA identified 85 pollutants of concern (priority, nonconventional, and conventional) in waste streams from RT/CHEM&PETR facilities. Most of these have at least one known toxic effect. Based on available physical-chemical properties and aquatic life and human health toxicity data for these pollutants, 22 exhibit moderate to high toxicity to aquatic life; 42 are human systemic toxicants; 14 are classified as known or probable carcinogens; 19 have drinking water values; and 16 are designated by EPA as priority pollutants. In terms of projected environmental partitioning among media, 16 of the evaluated pollutants are moderately to highly volatile; 34 have a moderate to high potential to bioaccumulate in aquatic biota; 24 are moderately to highly adsorptive to solids; and 21 are resistant to biodegradation, or are slowly biodegraded.

The impacts of three conventional and eight nonconventional pollutants are not evaluated when modeling the effect of the proposed regulation on receiving stream water quality and POTW operations or when evaluating the potential fate and toxicity of discharged pollutants. These pollutants are total suspended solids (TSS), 5-day biological oxygen demand (BOD_5), oil and grease, chemical oxygen demand (COD), total dissolved solids (TDS), total organic carbon (TOC), surfactants, total phosphorus, total phenols, adsorbable organic halides (AOX), and total petroleum hydrocarbons. The discharge of these pollutants can have adverse effects on human health and the environment.

ES.8.7 Documented Environmental Impacts

States identified five POTWs receiving the discharge from four TT/CHEM&PETR facilities and one RT/CHEM&PETR facility as being point sources causing water quality problems and are included on their 304(l) Short List. All POTWs listed currently report no problems with TEC wastewater discharges. Several POTW contacts stated the need for a national effluent guidelines for the TEC industry. State and Regional contacts in seven EPA Regions reported current and past problems caused by discharges from TEC facilities in the TT/CHEM&PETR and in the RT/CHEM&PETR subcategories. In addition, States issued fish consumption advisories for waterbodies that receive wastewater from 19 POTWs receiving discharges from 20 TT/CHEM&PETR facilities and two RT/CHEM&PETR facilities.

ES.9 COSTS AND BENEFITS OF THE TEC INDUSTRY PROPOSED RULE

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. Estimated benefits generated by the final regulation were summarized in Chapter 8.

The selected options are expected to have a total annual social cost of $15.5 million, which includes $15.0 million in pretax compliance costs, $0.5 million in administrative (permitting) costs, and $0.002 million in unemployment benefits administration costs. EPA estimates that annual benefits will range from $2.8 million to $9.8 million, which includes $1.8 million to $6.3 million for recreational benefits, and $0.9 million to $3.1 million for nonuse benefits.

ES.10 UNFUNDED MANDATES REFORM ACT

Title II of the Unfunded Mandates Reform Act of 1995 (Public Law 104-4; UMRA) establishes requirements for Federal agencies to assess the effects of their regulatory actions on State, local, and tribal governments as well as the private sector. Under Section 202(a)(1) of UMRA, EPA must generally prepare a written statement, including a cost-benefit analysis, for proposed and final regulations that "includes any Federal mandate that may result in the expenditure by State, local, and tribal governments, in the aggregate or by the private sector" of annual costs in excess of $100 million. As a general matter, a federal mandate includes Federal Regulations that impose enforceable duties on State, local, and tribal governments, or on the private sector.

The final TEC industry effluent limitations guidelines are not an unfunded mandate on state, local, or tribal governments because the cost of the regulation is borne by the TEC industry. The Final Rule does not impose total costs in excess of $100 million per year on the TEC industry. EPA examined increased permitting and unemployment benefits administrative costs and found them to be less than 1 percent of $100 million.

ES.11 REFERENCES

U.S. EPA. 1998. Economic Analysis of Proposed Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA 821/B-98-012. Washington, DC: U.S. Environmental Protection Agency, Office of Water. May.

U.S. EPA. 2000a. Cost-Effectiveness Analysis of Final Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA-821-R-00-014. Washington, DC: U.S. Environmental Protection Agency, Office of Water. June.

U.S. EPA. 2000b. Development Document for the Final Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA-821-R-00-012. Washington, DC: U.S. Environmental Protection Agency, Office of Water. June.

U.S. EPA. 2000c. Environmental Assessment of the Final Effluent Guidelines for the Transportation Equipment Cleaning (TEC) Industry. U.S. Environmental Protection Agency, Office of Water. June.

CHAPTER 1

INTRODUCTION

1.1 SCOPE AND PURPOSE

This Economic Analysis (EA) report evaluates the costs, economic impacts, and benefits of final effluent limitations guidelines and standards (known herein as the Final Rule) that provide for pollution control requirements for the transportation equipment cleaning (TEC) industry. The TEC industry provides interior tank cleaning services to the truck, rail, and water transportation industry. The cleaning services provided by the TEC industry support the nationwide flow of goods by ensuring that no contamination occurs among products from one shipment to the next. These cleaning services are provided for a variety of tanks and containers, including tank trucks, closed-top hopper trucks, rail tank cars, closed-top hopper rail cars, intermodal tank containers, tank barges, closed-top hopper barges, and ocean/sea tankers.

Except for commodities transported by pipelines, all food, chemical, and petroleum commodities are moved in bulk tank containers. Unless a particular tank is dedicated to the shipment of one product, interior tank cleaning is generally required between shipments. The cleaning process often generates wastewater, and that wastewater is the focus of this regulatory effort.

The Federal Water Pollution Control Act (commonly known as the Clean Water Act [CWA, 33 U.S.C. §1251 et seq.]) establishes a comprehensive program to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (section 101(a)). EPA is authorized under sections 301, 304, 306, and 307 of the CWA to establish effluent limitations guidelines and standards of performance for industrial dischargers. The standards EPA establishes include:

- Best Practicable Control Technology Currently Available (BPT). Required under section 304(b)(1), these rules apply to existing industrial direct dischargers. BPT limitations are generally based on the average of the best existing performances by plants of various sizes, ages, and unit processes within a point source category or subcategory.
- Best Available Technology Economically Achievable (BAT). Required under section 304(b)(2), these rules control the discharge of toxic and nonconventional pollutants and

apply to existing industrial direct dischargers.

- # Best Conventional Pollutant Control Technology (BCT). Required under section 304(b)(4), these rules control the discharge of conventional pollutants from existing industrial direct dischargers.[1] BCT limitations must be established in light of a two-part cost-reasonableness test. BCT replaces BAT for control of conventional pollutants.

- # Pretreatment Standards for Existing Sources (PSES). Required under section 307. Analogous to BAT controls, these rules apply to existing indirect dischargers (whose discharges flow to publicly owned treatment works [POTWs]).

- # New Source Performance Standards (NSPS). Required under section 306(b), these rules control the discharge of toxic and nonconventional pollutants and apply to new source industrial direct dischargers.

- # Pretreatment Standards for New Sources (PSNS). Required under section 307. Analogous to NSPS controls, these rules apply to new source indirect dischargers (whose discharges flow to POTWs).

EPA did not establish any national effluent limitations guidelines or standards for the TEC industry prior to this rule. EPA proposed this rule on June 25, 1998 (Federal Register, Vol. 63, No. 122, pp. 34686 - 34746), and published a Notice of Data Availability (NOA) on July 20, 1999 (Federal Register, Vol. 64, No. 138, pp. 38863 - 38877).

This section of the report presents the primary data sources EPA used to develop the economic profile of the industry and estimates of regulatory impacts of the Final Rule in Section 1.2. Section 1.3 discusses key environmental issues associated with this industry, and Section 1.4 presents the organization of the remainder of the report.

1.2 DATA SOURCES

As will be discussed in more detail in Chapter 2, facilities and companies in the TEC industry represent a wide range of industries. For many firms and facilities in the TEC industry, TEC services comprise only a very small part of their overall business, which cover a wide range of various manufacturing and other industries. Furthermore, even among firms and facilities that provide TEC

[1] Conventional pollutants include biochemical oxygen demand (BOD), total suspended solids (TSS), fecal coliform, pH, and oil and grease.

services as a large part of their business, some variation in industrial classification can occur (e.g., some might be classified in trucking and wholesale, and others in miscellaneous repair). Because of this phenomenon, most readily available information—such as that collected by the U.S. Department of Commerce, Bureau of the Census—does not adequately represent the TEC community affected by the Final Rule. The major data sources for this rulemaking are the EPA survey efforts performed under the authority of Section 308 of the Clean Water Act:

- 1993 Tank and container interior cleaning screener questionnaire (U.S. EPA, 1993)
- 1994 Detailed questionnaire for the transportation equipment cleaning industry (1994 technical data, 1992-1994 economic and financial data; U.S. EPA, 1995).

These surveys are referred to in later sections of this report as the Section 308 Survey screener survey and the Section 308 Survey detailed questionnaire.

EPA developed lists of facilities that the Agency considered likely to offer TEC services from industry and other sources. Using these lists, EPA issued the screener survey to better identify those facilities that were performing TEC operations and generating wastewater. EPA defined such facilities as "in scope" relative to the rulemaking. The screener survey contained 16 questions, most of which were multiple choice (see U.S. EPA, 1998b, Appendix G, for more detail). EPA mailed 3,267 screener questionnaires of which approximately 2,963 were returned and 734 were considered in-scope (Radian, 1994).

EPA used the information from the screener survey to develop the detailed questionnaire. This questionnaire was separated into two volumes:

- Part A: Technical Information
- Part B: Financial and Economic Information (see U.S. EPA, 1998b, Appendix F)

Facilities identified in the screener survey as performing TEC operations served as the data set for the statistical sampling frame for the detailed questionnaire. However, the size of the screener survey was limited by cost, and the survey identified only a subset of all TEC facilities in the United States (in other words, the in-scope population identified by the screener survey was a subset of the population). EPA sent the detailed questionnaire to a sample of approximately 300 facilities to minimize burden on the industry and to collect sufficient information for the analysis. The facilities that received the detailed questionnaire were identified by statistical methods (U.S. EPA, 1998c). The sampling frame for the detailed questionnaire was stratified on the basis of facility characteristics such as wastewater flow and employment. From these data EPA has estimated the number of facilities in the industry. However, the data are insufficient to estimate the number of companies in the industry. This problem is ameliorated, to some degree, because many facilities in the industry are stand alone businesses. This feature affects the small business analysis (see Chapter 6).

Other data sources used in the economic analysis include:

- *Development Document for the Final Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry*, referred to in this report as the Final Development Document (U.S. EPA, 2000b).
- Census data (particularly those illustrating the larger economic sectors supported by the TEC industry).
- Industry journals.
- Computerized literature searches.
- General economic and financial references (these are cited throughout the report).
- Anecdotal market information.

Throughout the rulemaking efort, EPA participated in industry conferences to exchange information and ideas. Public meetings also provided the opportunity for discussion and comment.

1.3 ENVIRONMENTAL PROTECTION ISSUES

The 1990 Pollution Prevention Act emphasized that EPA should seek solutions that focus on pollution prevention rather than end-of-pipe controls that may simply transfer the pollutants to another media. EPA identified several pollution prevention practices relevant to this industry:

Heel control

Water-use minimization (e.g., flow minimization)

Pretreatment and sludge pollutant minimization

Heel control means removing as much material as possible from the bottom of the tank (i.e., "heel") after the product is delivered prior to cleaning. Heel control reduces the amount of pollutants that must be recaptured by the wastewater treatment system. The TEC industry has grown increasingly aware of the problem of heel control, and has instituted a voluntary heel control program as a means of reducing pollutants in the wastewater stream (Modern Bulk Transporter, 1996).

Minimizing the amount of water used to clean tanks through flow minimization technology results in several benefits. First, the water pollution control equipment can be sized for the smaller volume of effluent that needs to be treated. This leads to lower overall equipment costs and operation and maintenance costs for a given facility. Second, the smaller volume of wastewater produced contains higher pollutant concentrations (i.e., same pollutant mass in a smaller volume of water). This results in higher efficiencies for the pollution control equipment (U.S. EPA, 1998a).

Through pretreatment, indirect dischargers limit the concentration of certain pollutants (including heavy metals and organic chemicals) in wastewater discharged to a treatment works. These programs minimize interference with the treatment process at the POTW, and also can significantly improve the quality of sewage sludge. Sludge that meets concentration limits for 10 metals (arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc) can be applied to land (e.g., used as fertilizer) in certain circumstances (40 CFR Part 503).

1.4 REPORT ORGANIZATION

This EA Report is organized as follows:

Chapter 2—Industry Profile

Provides background information on the facilities, companies, and industry affected by the Final rule. Due to the lack of publicly available information about the TEC industry, the industry profile is based primarily on two surveys implemented by EPA.

Chapter 3—Economic Impact Analysis Methodology Overview

Summarizes the economic methodology by which EPA examines incremental pollution control costs and their associated impacts on the industry. More detailed information on the economic methodology is located in Appendixes A through E of the proposal EA report (U.S. EPA, 1988b).

Chapter 4—Pollution Control Options

Presents short descriptions of the regulatory options considered by EPA. More detail is given in the Final Development Document (U.S. EPA, 2000b).

Chapter 5—Economic Impacts

Using the methodology presented in Chapter 3, EPA presents the annualized costs reflecting the capital and annual operating and maintenance costs that are associated with more stringent pollution control. EPA also presents the economic impacts associated with the regulatory costs, including impacts on facilities, companies, industry output, and TEC employment. In other words, this chapter presents the findings on which EPA based its determination of economic achievability under the CWA.[2]

Chapter 6—Small Business Analysis

EPA is certifying that the Final Rule will not have a significant impact on a substantial number of small businesses. However, EPA did prepare a small business analysis.

Chapter 7—Benefits Methodology

Summarizes the methodology by which EPA identifies, qualifies, quantifies, and—where possible—monetizes the benefits associated with reduced pollution.

Chapter 8—Environmental Assessment and Benefits Analysis

Using the methodology described in Chapter 7, EPA prepares an assessment of the nationwide benefits of the regulation.

Chapter 9—Cost and Benefits of the TEC Industry Final Rule

[2] EPA also calculated the pollutant removals, cost-effectiveness, and cost-reasonableness associated with the regulatory options. This information is presented in a separate report (U.S. EPA, 2000a).

Using the benefits described in Chapter 8, EPA presents an assessment of the nationwide costs and benefits of the regulation pursuant to Executive Order 12866 and the Unfunded Mandates Reform Act (UMRA).

- Chapter 10—Unfunded Mandates Reform Act

  Provides a “road map” showing how the EA is responsive to each of the relevant provisions of UMRA.

1.5 REFERENCES

Modern Bulk Transporter. 1996. Tank container industry members review the role each one plays. Modern Bulk Transporter. Houston, TX. December:42.

Radian. 1994. Draft screener database report for the transportation equipment cleaning industry. Prepared for U.S. Environmental Protection Agency, Office of Water, by Radian Corporation. Herndon, VA. December 14.

U.S. EPA. 1993. Tank and container interior cleaning screener questionnaire. OMB No. 2040-0166. Washington, DC: U.S. Environmental Protection Agency, Office of Water.

U.S. EPA. 1995. 1994 Detailed questionnaire for the transportation equipment cleaning industry. OMB No. 2040-0179. Washington, DC: U.S. Environmental Protection Agency, Office of Water. April.

U.S. EPA. 1998a. Development Document for Proposed Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA 821/B-98-011. Washington, DC: U.S. Environmental Protection Agency, Office of Water. May.

U.S. EPA. 1998b. Economic Analysis of Proposed Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA 821/B-98-012. Washington, DC: U.S. Environmental Protection Agency, Office of Water. May.

U.S. EPA. 1998c. Statistical Support Document of Proposed Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA 821/B-98-014. Washington, DC: U.S. Environmental Protection Agency, Office of Water. May.

U.S. EPA. 2000a. Cost-Effectiveness Analysis of Final Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA-821-R-00-14. Washington, DC: U.S. Environmental Protection Agency, Office of Water. June.

U.S. EPA. 2000b. Development Document for the Final Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA-821-R-00-12. Washington, DC: U.S. Environmental Protection Agency, Office of Water. June.

CHAPTER 2

INDUSTRY PROFILE

2.1 OVERVIEW

Transportation services provide a vital link in the U.S. economy, transporting raw materials, intermediate goods, and finished goods throughout the nation as needed. Transportation equipment cleaning (TEC) services support the nationwide flow of goods by reducing and eliminating contamination that could occur among products from one shipment to the next. EPA's final effluent guidelines for the TEC industry (the Final Rule) cover wastewater discharges from interior tank cleaning services provided by this industry to the truck, rail, and water transportation industries. These cleaning services are provided for a variety of tanks and containers, including tank trucks, closed-top hopper trucks, rail tank cars, closed-top hopper rail cars, intermodal tank containers, tank barges, closed-top hopper barges, and ocean/sea tankers.

Except for commodities transported by pipelines, all food, chemical, and petroleum commodities are moved in bulk tank containers. Unless a particular tank is dedicated to the shipment of one product, interior tank cleaning is generally required between shipments. More detailed descriptions of the containers and cleaning methods are described in the Final Development Document (U.S. EPA, 2000).

The TEC industry has three major characteristics that affect the structure of this economic analysis:

- It is a service industry.
- The demand for TEC services is derived from, or is based on, the demand for transportation services.
- TEC services are provided by both in-house facilities (e.g., trucking firms that clean their own tanks) and commercial facilities (those that clean tanks as a service to other firms).

Industry output (i.e., the number of cleanings performed by the industry) is directly dependent on the demand for transportation services. For example, as the demand for tank truck services increases, the demand for tank truck cleaning services increases. The demand for TEC services is also linked to the demand for the commodities carried in the tank containers. An increase in the demand for petroleum, for example, will increase the demand for tank containers in which to ship petroleum. This increase in the demand for tank containers will increase the demand for tank cleanings.

The TEC industry is a multi-faceted industry with links to all sectors of the economy. Section 2.2 describes the process that EPA used to identify and define the industry for the purposes of the Final Rule. Section 2.3 presents the industry subcategories and discusses the scope of the Final Rule. Sections 2.4 and 2.5 present facility-level and company-level information, respectively. Baseline (or preregulatory) price and quantity estimates are described in Section 2.6. Section 2.7 discusses industry growth, while Section 2.8 discusses international competition.

2.2 INDUSTRY DEFINITION FOR THE EFFLUENT GUIDELINES

2.2.1 Definition Process Description

When EPA develops effluent guidelines for an industry, EPA may, based on the characterization of that industry, divide the industry into several groups, or subcategories, to more completely analyze the differences in processes or other characteristics in order to craft effluent guidelines or pretreatment standards. For the purpose of establishing effluent guidelines for the TEC industry, EPA described the different processes among the numerous types of cleaning operations the industry performs.

To determine the potential scope of a rule and possible subcategories, EPA analyzed the TEC industry with respect to the cleaning processes (the sources of discharged wastewater) that are used within the industry. To understand the variability in these cleaning processes, EPA first examined the differences in demand for cleaning services. This analysis identified five major operational structures that exist within the TEC industry:

- Independent—Facilities that provide TEC services as their primary source of revenue. These facilities do not own their own transportation fleets.

- Carrier—Facilities that own and/or operate their own transportation fleets to carry other companies' cargos.

- Shipper—Facilities that own and/or operate a transportation fleet to carry their own cargos.

Builder/Leaser—Facilities that build or repair transportation fleets and lease them.

Other—Facilities that are combinations of the operational structures defined above or that provide services not classified above (e.g., construction services).

The data indicate there are two major types of TEC operations. The first type of operation, "in-house" TEC providers, comprises companies that manufacture commodities (shippers), provide transportation and warehouse services (carriers), or build or repair transportation equipment (builder/leasers). These types of operations frequently provide their own tank cleaning services. They do so for convenience and quality control, and to limit their environmental liability. These services are generally provided at cost to other operations within the facility, although some facilities may perform a small number of commercial tank cleanings (e.g., for outside, unrelated clients). The distinguishing feature of these facilities is that TEC is not their primary service, and TEC services generally account for only a very small share of total facility revenues, employment, and cost. The second type of operation, "commercial" TEC providers, comprises independents, which provide TEC services as their primary business (although many facilities also offer some light repair services). For these operations, TEC services provide the dominant share of total facility revenues, employment, and cost.

Many facilities provide TEC services even though those services may not comprise a significant share of their primary business. For example, facilities that were determined to be within the industry listed a wide range of SIC codes for their primary business activity in the detailed questionnaire of the Section 308 Survey. Table 2-1 shows that the SIC codes range from 1560 (General Building Contractors) to 7966 (Amusement and Recreation Services), including the more-expected 4213 (Trucking and Warehousing) and 7699 (Miscellaneous Repair). This heterogeneity in business definition affects the small business analyses, required by the Regulatory Flexibility Act (RFA) as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996, because definitions of "small" vary by industry as defined by SIC codes (Section 2.5.2). This heterogeneity also meant that EPA could not rely solely on publicly available data, which is organized by industry, since the TEC industry ranges across so many industry sectors.

The initial process that EPA used to define the TEC industry is illustrated in Figure 2-1. The left-hand circle corresponds to facilities with manufacturing or transportation operations, while the right hand circle encompasses facilities with TEC operations. The intersection of the two circles contains

TABLE 2-1

TEC FACILITIES BY SIC CODE AND COMMERCIAL STATUS

SIC Categor		4-digit SIC Code	Commercia Facilities [1]	In-house Facilities [1]	Total Facilities [1]
15	Building Construction	1560		3	3
20	Food and Kindred Products	2037		17	17
		2077		41	41
		2079		86	86
37	Transportation Equipment	3743	2		2
39	Miscellaneous Manufacturing Industries	3930	7		7
42	Motor Freight Transportation & Warehousing	4200		44	44
		4210		14	14
		4212		13	13
		4213	18	120	138
		4231	7	54	61
44	Water Transportation	4400	2		2
		4463		1	1
		4491	8	3	11
		4492	3	3	7
		4499	6	0	6
47	Transportation Services	4700	7		7
		4741	6	6	13
		4785	1		1
		4789	5	7	12
51	Wholesale Trade -- Nondurable Goods	5161		11	11
		5172		9	9
63	Insurance Carriers	6338		7	7
73	Business Services	7398	8		8
75	Automotive Repair, Services, and Parking	7512	2		2
		7542	22		22
76	Miscellaneous Services	7692	1		1
		7699	125	11	136
79	Amusement and Recreation Services	7966	7		7
	Total	--	240	452	692

Numbers may not sum to totals due to rounding.
[1] From national estimates based on detailed questionnaire database.

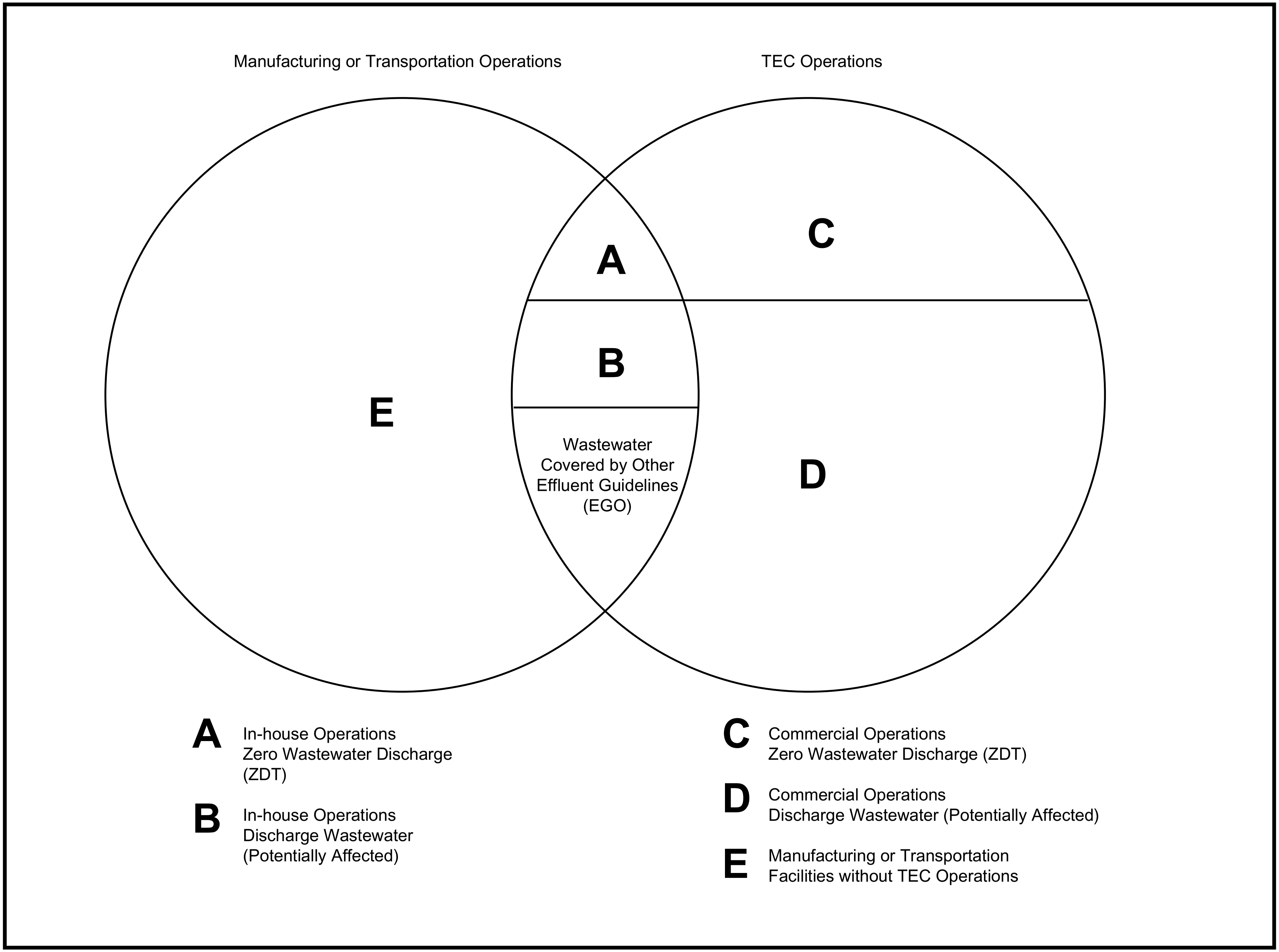

Figure 2-1. Definition of Affected TEC Industry Facilities

those facilities whose primary business is not tank cleaning, but maintain TEC operations in support of their primary line of business. These facilities within the intersection correspond to the carrier, shipper, builder/leaser, and other operational structures defined above. Those facilities contained in the right hand circle but lying outside the intersection of the two circles correspond to the facilities defined as "independent" in the structural analysis discussed above.

Some facilities that provide manufacturing or transportation services commingle their TEC wastewater with other process wastewater and use a single wastewater treatment system. Where such facilities are already regulated by other effluent guidelines, EPA determined that, rather than add an additional regulatory burden, the first guideline took precedence.[1] Examples of "effluent guideline, other" (EGO) operations include tank cleanings performed by dairies, chemical manufacturers, and industrial waste combusters. To ensure these EGO facilities are not covered by the Final Rule, EPA specifically excludes from coverage facilities whose tank cleanings are operated in conjunction with other industrial or commercial operations so long as the facility only cleans tanks that contained raw materials, by-products, and finished products associated with a facility's onsite processes. Facilities that meet this exclusion are the most likely to be covered by other effluent guidelines. To the extent that EPA could identify such facilities in the database, these facilities are removed from the analysis. The portion of Figure 2-1 identified as EGO represents these facilities.

Areas A and B in Figure 2-1 represent TEC operations at facilities with primary operations that do provide tank cleaning services, are not covered by a pre-existing guideline, or do not meet the exclusion discussed above. These facilities could be affected by the Final Rule. Because TEC operations are performed at such facilities primarily to support other business activities, EPA designates such facilities as "in-house" for the purposes of this analysis. The operational structure explains why these facilities provide TEC services; the designation "in-house" characterizes the type of TEC services provided.

Within the intersection, Area A represents facilities that do not discharge wastewater, while Area B represents those that do discharge wastewater. For the proposal, all discharging facilities were considered "potentially affected" facilities because they clean tank containers and discharge process wastewater directly to U.S. surface waters or indirectly to publicly owned treatment works (POTWs).

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[1] Regulatory coordination such as this is consistent with EPA's Common Sense Initiative, which was announced on 20 July 1994.

Discharging facilities may be affected by the effluent guidelines (depending on the scope of the Final Rule—see Section 2.3) and may bear incremental pollution control costs. Those facilities that do not discharge wastewater (the "A" facilities) may, for example, recycle all their wastewater or have it hauled to a commercial centralized waste treatment center. These facilities are designated "zero discharge TEC" (ZDT) facilities and are not considered potentially affected by the Final Rule.

Areas C and D denote facilities that provide tank cleaning services as their sole or primary business. TEC services account for a very significant percentage of total revenues, employment, and cost at these facilities. These facilities provide TEC services primarily for commercial customers; the EPA designates such facilities as "commercial" for the purposes of this analysis.[2] Commercial facilities range from large nationwide chains of tank cleaning facilities to relatively small, single-facility companies. Like in-house facilities, commercial facilities may be dischargers (potentially affected, if covered by the Final Rule) or nondischargers (not potentially affected by this rulemaking).

The remaining area in Figure 2-1—Area E—indicates manufacturing or transportation operations that do not have TEC operations. None of the facilities represented by Area E are affected by this rulemaking.

Comparing SIC codes reported by TEC facilities, commercial facilities are generally a homogeneous group, while in-house facilities are more heterogeneous. The most frequent SIC code among commercial facilities is 7699 (within the miscellaneous services group); 52 percent of potentially affected facilities fall into this category. The remaining 115 facilities are distributed over 17 other SIC codes. In comparison, the most frequent in-house SIC code is 4213 (within the motor freight transportation & warehousing industry); only 27 percent of potentially affected in-house facilities report this code. The remainder are spread over 18 SIC codes. Furthermore, comparison with the 1994 County Business Patterns illustrates that even within these codes, tank cleaning facilities comprise a very small percentage of all establishments. Tank cleaning facilities in SIC codes 4210, 4212, and 4213 comprise less than 0.2 percent of all establishments (165 of 109,000 establishments) in the three-digit SIC code 421. Tank cleaning facilities in SIC 7699 comprise only 0.4 percent of all establishments in that four-

[2] The definition that the Agency used to assign the designation "commercial" or "in-house" is based on the percentage of tank cleanings performed at the facility for commercial clients. If a facility indicated in the survey that more than 50 percent of cleanings were performed for commercial clients, the facility was deemed commercial.

digit SIC code (136 of 34,000 establishments, U.S. Bureau of the Census, 1996). Thus, the TEC industry is well diffused through the U.S. economy, forming a small share of many different industries and a significant share of none.

2.2.2 Summary and Facility Count

As discussed above, there are two major, intersecting classifications for the economic industry profile:

- in-house or commercial facilities
- discharging or nondischarging facilities

The facility counts[3] represented by the areas in Figure 2-1 are approximately:

- 1,229 facilities (not previously regulated)
- 910 in-house facilities (Areas A and B)

  — 452 dischargers (Area B)
  — 458 ZDT (Area A)
- 319 commercial facilities (Areas C and D)

  — 240 dischargers (Area D)
  — 79 ZDT (Area C)
- 692 discharging facilities (Areas B and D)
- 537 ZDT facilities (Areas A and C)

The primary focus of the economic analysis is on the discharging facilities. Note, however, that the Final Rule contains an exclusion for low flow dischargers, defined as facilities that discharge less than 100,000 gallons of TEC generated wastewater a year. The low flow dischargers are included in the

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[3] These are the national estimates for the nationwide number of facilities. They are weighted estimates statistically derived from the detailed questionnaire data and sampling weights (SAIC, 1997). Unless otherwise specified, such as in Section 2.6, all results are weighted national estimates.

profile and analyses that follow, but are assigned no costs in the impact analyses. Additionally, ZDT facilities are included to some extent in the profile, but are not discussed in the impact analyses. The ZDT facilities and low flow dischargers will not be directly affected by the guideline; because they do not discharge wastewater or are excluded from coverage, they will bear no incremental pollution control costs as a result of the regulation.

However, ZDT and low flow facilities are an integral part of the industry profile for two reasons. First, the technologies ZDT facilities use provide a basis for considering zero-discharge options for the TEC facilities that currently discharge. Second, although commercial ZDT and low flow facilities do not incur pollution control costs, they compete directly with commercial discharging facilities that do incur those costs. If a significant percentage of commercial cleaning facilities within a subcategory incur no costs, it will be more difficult for discharging facilities to pass on their increased costs to their customers. The competitive pressure of the ZDTs and exempted low flow facilities will place downward pressure on prices. If pollution control costs cannot be passed on to customers, then the additional pollution control costs must be paid out of profits; this increases the likelihood that some facilities will have to close because they cannot bear the increased burden. This likelihood is discussed in more detail in Chapter 3.[4]

2.3 SUBCATEGORIES, DISCHARGE TYPES, AND SCOPE OF THE RULE

The number of facilities potentially affected by the Final Rule also depends on the subcategorization of the industry and whether the subcategory is selected for regulation. EPA initially divided the TEC industry into 11 subcategories on the basis of commodity transported and the mode of transportation (U.S. EPA, 1998a). In general, the commodity transported affects the types of pollutants found in the wastewater stream. The three major commodities encountered in the TEC industry are chemical, petroleum, and food products. The mode of transportation affects the volume of wastewater produced. A number of types of conveyances are cleaned by the TEC industry. These include tank trucks, rail cars, tank barges, intermodal tank containers (those that can move, for example, from trucks to rail cars), intermediate bulk containers (IBCs), ocean/sea tankers, and various types of hoppers, which

[4] Unlike commercial ZDT facilities, in-house ZDTs neither incur costs nor affect market behavior. They are included in the industry profile for completeness.

generally transport dry bulk materials such as grain, fertilizer, and pelletized plastic.[5] These containers vary significantly by size. For example, rail tank cars are larger than tank trucks and tank barges are larger than both. Larger volumes of wastewater are required to clean larger tanks. The concentration of pollutants in the wastewater stream affects the efficiency of the pollution control technology; thus the volume of wastewater is relevant for specifying and analyzing the Final Rule.

The original 11 subcategories at proposal were as follows:

- Truck Chemical (TT/CHEM)[6]
- Rail Chemical (RT/CHEM)
- Barge Chemical and Petroleum (TB/CHEM)[7]
- Truck Petroleum (TT/PETR)
- Rail Petroleum (RT/PETR)
- Truck Food (TT/FOOD)
- Rail Food (RT/FOOD)
- Barge Food (TB/FOOD)
- Truck Hopper (TH/HOPPER)
- Barge Hopper (BH/HOPPER)

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[5] Several of these container types are not covered by the final rule. IBCs are not covered by the Final Rule for reasons discussed in the preamble to the rulemaking. EPA, however, has provided an analysis of impacts had they been covered in Appendix A of this report. Although IBCs are cleaned by many TEC facilities, the determination of whether a facility is potentially affected is not made on the basis of whether it cleans IBCs. The engineering costs estimates do, however, account for wastewater flows associated with IBC cleaning at regulated TEC facilities. Also note that no discharging facilities surveyed reported cleaning ocean/sea tankers.

[6] This subcategory contains facilities that clean a significant number of intermediate bulk containers (IBCs) and intermodal tank containers in addition to tank trucks; 75 ZDT facilities, which are unaffected by the regulation, clean IBCs exclusively. Discharges from the cleaning of IBCs is not covered by the Final Rule.

[7] Effluent sampling before proposal found that no significant difference existed between TB/CHEM and TB/PETR subcategories; these two subcategories were therefore combined into a single TB/CHEM&PETR subcategory at proposal.

- Rail Hopper (RH/HOPPER)

These subcategories are not completely exclusive; for example, some truck facilities do clean small numbers of rail tank cars. However, the subcategorization scheme was in large part self-sorting (see Section 2.5.3 and Final Development Document, U.S. EPA, 2000, for further details).

During and following proposal, EPA determined that a number of the subcategories listed above either did not require regulation or could be combined into one subcategory. All the HOPPER subcategories were found to have insignificant pollutant loadings and, as proposed, will not be regulated by the Final Rule. EPA also determined that the chemical and petroleum subcategories for both truck and rail subcategories could be combined. Additionally, EPA combined all the FOOD subcategories into one subcategory.

The Agency then further divided each subcategory into direct and indirect dischargers. Direct dischargers discharge wastewater directly to surface water and indirect dischargers discharge wastewater to a publicly owned treatment works (POTW). EPA regulates direct and indirect dischargers differently. Best Available Technology Economically Achievable (BAT) standards set effluent limitations on toxic and nonconventional pollutants for direct dischargers prior to wastewater discharge directly into a water body such as a stream, river, lake, estuary, or ocean. Indirect dischargers send wastewater to a POTW for further treatment prior to discharge to U.S. surface waters; Pretreatment Standards for Existing Sources (PSES) set limitations for indirect dischargers on toxic and nonconventional pollutants which pass through a POTW.
EPA found that nearly all surveyed facilities are indirect dischargers, with minor exceptions (primarily in the FOOD subcategories and the barge subcategory). EPA used the screener survey to provide information on direct dischargers (see the proposal EA report for details on how the screener survey was used to provide information U.S. EPA, 1998b). The FOOD subcategory was also divided into direct and indirect dischargers, but only the direct dischargers will be covered by the Final Rule. These changes mean that the following subcategories will be regulated:

- Truck Chemical and Petroleum (TT/CHEM&PETR), both direct and indirect dischargers.
- Rail Chemical and Petroleum (RT/CHEM&PETR), both direct and indirect dischargers.
- Barge Chemical and Petroleum (TB/CHEM&PETR), both direct and indirect dischargers.

Truck, Rail, and Barge Food (FOOD), direct dischargers only.

Table 2-2 presents the categorization of all 1,229 facilities captured in the Section 308 survey (detailed questionnaire) into each of the subcategories (including the HOPPER subcategory, which will not be regulated as discussed above). This table shows the total number of discharging facilities and the total number of ZDT facilities identified in the Section 308 Survey, detailed questionnaire by commercial and in-house status.

The remainder of this profile will focus on the regulated facilities. Table 2-3 divides the regulated subcategory facilities into direct and indirect dischargers. Facilities in the HOPPER subcategory and FOOD subcategories were profiled in the proposal EA report (U.S. EPA, 1998b). Because EPA made no changes to these subcategories, these subcategories will not be included in the discussions that follow except where noted. Also, generally not included is detailed information on a number of direct dischargers, totaling 23 facilities, due to data availability and data confidentiality issues, with the exception of the 10 direct discharging facilities in the TB/CHEM&PETR subcategory. These 10 facilities were captured in the Section 308 Survey detailed questionnaire. Thus, this section focuses primarily on the 368 indirect discharging facilities (see Table 2-3) plus 10 direct discharging facilities for a total of 378 facilities. Direct dischargers in the TT/CHEM&PETR, RT/CHEM&PETR, and FOOD subcategories are assumed to be similar to indirect dischargers in those respective subcategories. Finally, note that some information on IBCs is included even though these cleanings are not regulated under the TECI Final Rule.

2.4 FACILITY-LEVEL INFORMATION

This section analyzes facility-level information on the basis of subcategory and commercial/in-house status.[8] The key variables used to characterize the industry are tank cleanings, revenues, employment, costs, and assets; all numbers cited are 1994 values. These variables are examined at the facility level and at the level of TEC operations only. In general, it will be observed that the most

[8] Data examined in this section are based on statistically weighted responses to the detailed questionnaire; as explained above, information on the direct dischargers found in the screener survey is not comparable with these data because it was not drawn from the same sample frame.

TABLE 2-2

TEC FACILITIES BY SUBCATEGORY, DISCHARGE TYPE, AND COMMERCIAL STATUS

	Dischargers		Zero Discharge		
Subcategory	**Commercial**	**In-house**	**Commercial**	**In-house**	**Total**
TT/CHEM&PETR[1]	140	183	55	282	661
RT/CHEM&PETR	18	22	17	14	71
TB/CHEM&PETR	12	3	5	11	31
FOOD	44	217	0	145	407
HOPPER	25	26	2	5	59
Total	240	452	79	458	1,229

National estimates from detailed questionnaire database.
Numbers may not sum to total due to rounding; subcategory-specific detail may not precisely match between tables due to rounding.
[1] Includes intermediate bulk container (IBC) and intermodal facilities.

TABLE 2-3

DIRECT AND INDIRECT DISCHARGERS BY REGULATED SUBCATEGORY

Subcategory	Direct Dischargers	Indirect Dischargers
TT/CHEM&PETR	3[1]	322
RT/CHEM&PETR	1[1]	41
TB/CHEM&PETR	10	5
FOOD	19[1]	NR
Total	33[2]	368

Note: Numbers may not sum to total due to rounding; subcategory-specific detail may not precisely match between tables due to rounding.
NR: Not regulated.
[1] Number of direct dischargers are estimated from screener survey
[2] Includes direct dischargers estimated from screener survey, as well as direct dischargers estimated from the detailed questionnaire. Note that four TB/CHEM&PETR direct dischargers have become indirect dischargers since proposal.

Source: Section 308 Survey, detailed questionnaire and screener survey.

significant economic differences between facilities are associated with the commercial/in-house distinction rather than subcategorization.

2.4.1 Tanks Cleaned

Table 2-4 presents the number of tank cleanings performed by regulated facilities, by subcategory and commercial status. Overall, tank trucks comprise some 87 percent of all tanks cleaned, followed by IBCs (6 percent) and rail tank cars (3 percent). In general, the data in Table 2-4 supports the claim that the subcategorization by transportation mode is self-sorting; for example, although facilities in the TT/CHEM&PETR subcategory clean over 1,000 rail tank cars, 90 percent of all tanks cleaned by the subcategory are tank trucks while another 8 percent are intermodal containers and IBCs.

The second important feature of Table 2-4 is that it emphasizes the significance of commercial facilities in the industry. In general, commercial facilities are typically much smaller than in-house facilities when measured by facility revenues, costs, and employment; commercial facilities also comprise only 45 percent of all discharging TEC facilities (170 of 378 regulated TEC facilities captured in the Section 308 Survey detailed questionnaire are commercial). However, because commercial facilities devote most of their resources to tank cleaning, they actually perform two-thirds of all TEC operations. (More detail on facility data is given in Section 2.4.2 below.) Moreover, this means one third of all cleanings provided in the United States by regulated facilities are performed by facilities whose primary business interests lie elsewhere.

The in-house/commercial distinction is especially important in understanding the largest subcategory, TT/CHEM&PETR. On average, the 140 commercial TT/CHEM&PETR facilities perform about twice as many cleanings per year as the 183 in-house facilities. In fact, the 140 commercial TT/CHEM&PETR facilities comprise only a little over a third of the total number of regulated TEC facilities, yet they perform nearly two thirds of all tank cleanings by regulated facilities in all subcategories. Thus, the TT/CHEM&PETR facilities are distinguished not only by the total number of tank cleanings performed, but also by the relatively high number of cleanings per facility.

TABLE 2-4

TANK CLEANINGS BY TANK TYPE, COMMERCIAL STATUS, AND SUBCATEGORY, REGULATED FACILITIES

Subcategor	Commercia Status	Tank Trucks	Closed-Top Hoppers	Intermoda Containers	Intermediate Bulk Containers	Rail	Closed-Top Hopper Ra	Inland Barge	Closed-Top Hopper Barge	Ocean/Sea Tankers	Other	Total, Comm. Status and Subcategor	Total by Subcategor	Percent by Subcategor
TT/CHEM&PETR	Commercia	716,023	13,952	9,471	70,571	1,066					5,875	816,958	1,231,617	96.1%
	In-house	397,475	3,682	3,702	9,800							414,659		
RT/CHEM&PETR [1]	Commercia	3,693	25	70		22,543	4,564					30,895	42,349	3.3%
	In-house					9,133	2,321					11,454		
TB/CHEM&PETR	Commercia							7,267				7,267	7,744	0.6%
	In-house	42						435				477		
Total [1]		1,117,233	17,659	13,243	80,371	32,742	6,885	7,702	0	0	5,875	–	1,281,710	100.0%
Percent of Total		87.2%	1.4%	1.0%	6.3%	2.6%	0.5%	0.6%	0.0%	0.0%	0.5%	0.0%	100.0%	–

[1] Includes CHEM only portion of the RT/CHEM&PETR subcategory due to business information confidentiality.

Table 2-5 presents the distribution of facilities by percentage of commercial cleanings. The distribution is bimodal, with 92 percent of the facilities performing either more than 90 percent or less than 10 percent of cleanings commercially.

2.4.2 Facility Revenues

Table 2-6 summarizes total facility revenues and facility revenues from TEC operations. Overall regulated facility revenues exceed $1.7 billion; however, only $195.3 million, or 11 percent, is attributable to TEC operations. Table 2-7 contains a more detailed breakdown for revenue data by subcategory and commercial status. The majority of revenues are derived from the manufacturing and transportation services provided by in-house facilities. The average in-house facility earns four times the revenues earned by the average commercial facility. However, the average commercial facility earns eight times the revenues from TEC operations earned by an in-house facility. Thus, while revenues from TEC operations comprise 47 percent of facility revenues for commercial facilities, they comprise less than 2 percent of revenues for in-house facilities.[9]

A total of 19 facilities reported zero revenues; these facilities are **cost centers**. That is, these are facilities that do all or almost all of their cleanings to support another business activity while the main location for the primary business activity is located elsewhere; the company itself views TEC as simply a cost of doing its larger business activity. Companies owning cost centers have the ability to switch from cleaning their own tanks on an in-house basis to outsourcing their tank cleaning needs. The outsourcing decision is modeled as a component of the market model (Chapter 3).[10]

Since, by definition (see Section 2.2.1), in-house facilities perform less than 50 percent of cleanings commercially, small TEC revenues do not necessarily mean small TEC operations. However, other data confirm that TEC operations at in-house facilities tend to be smaller than at commercial

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[9] TEC revenues do not form 100 percent of the revenues for commercial facilities because commercial facilities are defined as those that perform more than 50 percent of their cleanings for commercial clients; this definition therefore includes facilities that earn substantial revenues from non-TEC activities.

[10] The existence of cost centers affects the financial closure analysis. For these facilities, the economic analysis defaults to the company level.

TABLE 2-5

PERCENTAGE OF COMMERCIAL CLEANINGS BY REGULATED FACILITIES

Percent Commercial Cleanings	Number of Facilities in Range[1]	Percent Facilities in Range
0%	121	31.9%
1-10%	76	20.1%
11-20%	0	0.0%
21-30%	6	1.6%
31-40%	0	0.0%
41-50%	7	1.8%
51-60%	0	0.0%
61-70%	0	0.0%
71-80%	7	1.0%
81-90%	10	2.6%
91-99%	2	0.5%
100%	150	39.6%

Note: Percentages do not total to 100.0% due to rounding; numbers may not precisely match other tables due to rounding.
[1] From national estimates based on detailed questionnaire database.

TABLE 2-6

FACILITY REVENUES AND FACILITY REVENUES FROM TEC OPERATIONS BY SUBCATEGORY

Subcategory	Number of Regulated Facilities[1]	Total Revenues	Average Revenues	Total TEC Revenues	Average TEC Revenues
TT/CHEM&PETR	322	$1,595,381,890	$4,954,602	$130,491,651	$405,254
RT/CHEM&PETR[2]	41	$61,754,517	$1,635,514	$23,807,478	$630,520
TB/CHEM&PETR	15	$51,368,504	$3,377,350	$40,976,842	$2,694,124
Total[2]	378	$1,708,504,911	$4,556,013	$195,275,971	$520,736

[1] From national estimates based on detailed questionnaire database; subcategory-specific detail may not precisely match between tables due to rounding.
[2] Does not include revenue data from three facilities previously designated at proposal as RT/PETR to avoid disclosure of confidential business information. Averages are calculated without these facilities.

TABLE 2-7

FACILITY REVENUES AND FACILITY REVENUES FROM TEC OPERATIONS BY SUBCATEGORY AND COMMERCIAL STATUS

	Commercial			In-house		
Subcategory	**Number of Regulated Facilities[1]**	**Total Revenues**	**Total TEC Revenues**	**Number of Regulated Facilitites**	**Total Revenues**	**Total TEC Revenues**
TT/CHEM&PETR	140	$284,981,791	$115,125,597	183	$1,310,400,097	$15,366,055
RT/CHEM&PETR[2]	18	$34,850,621	$18,654,913	22	$26,903,896	$5,152,565
TB/CHEM&PETR	12	$48,443,897	$40,097,146	3	$2,924,606	$879,696
Total	170	$368,276,309	$173,877,656	208	$1,340,228,599	$21,398,316

[1] From national estimates based on detailed questionnaire database; subcategory-specific detail may not precisely match between tables due to rounding.
[2] Includes count of three facilities in the former RT/PETR subcategory, but totals do not reflect data for these facilities due to business information confidentiality issues.

facilities. Table 2-8 summarizes facility employment. Overall, regulated TEC facilities employ nearly 16,000 workers; less than 20 percent of those workers—2,706 employees—are devoted to TEC operations. Table 2-9 provides employment information by subcategory and commercial status. The average number of employees engaged in TEC operations at in-house facilities is only 7 percent of overall in-house facility employment. The average number of TEC employees at an in-house facility is about half the average number of TEC employees at commercial facilities, while total facility employment at in-house facilities is about four times total facility employment at commercial facilities. This information again emphasizes the fact that in-house facilities are generally much larger than commercial facilities, but that TEC operations form only a very small part of facility activities.[11]

2.4.3 Facility Costs

Tables 2-10 and 2-11 summarize facility cost information. Facility costs due to TEC operations comprise 12.5 percent of overall operational costs for regulated facilities. Total facility operations cost $1.7 billion while TEC operations cost $212.7 million. For 68 facilities, TEC costs were not tracked. The ratio of TEC costs to facility costs for carriers was used to estimate the derived demand for TEC services in the market model; see Section 2.9 below. The basic differences between commercial and in-house facilities are again apparent (see Table 2-11). TEC operations account for 46 percent of total facility costs at commercial facilities and for less than 5 percent of total costs at in-house facilities.

2.4.4 Facility Assets

Table 2-12 summarizes the facility asset information. Assets among regulated facilities' operations total $0.9 billion, with average assets of $2.5 million per facility. However, most of these

[11] Companies may show in-house operations as transferring services at cost to other parts of the facility, or they may record as revenue only the commercial cleanings performed at the facility. Financial data for these facilities may show little or no profit. Any additional cost may make the facility appear unprofitable when, in reality, the company would adjust the transfer cost or consider outsourcing. For these facilities, the financial analysis defaults to the company level while the market model addresses whether the company would outsource its TEC operations.

TABLE 2-8

FACILITY EMPLOYMENT AND FACILITY EMPLOYMENT
FOR TEC OPERATIONS BY SUBCATEGORY

Subcategory	Number of Regulated Facilities[1]	Total Employment	Average Employment	Total TEC Employment	Average TEC Employment
TT/CHEM&PETR	322	12,875	40	1,932	6
RT/CHEM&PETR[2]	41	2,190	58	276	7
TB/CHEM&PETR	15	707	47	498	33
Total[2]	378	15,722	42	2,706	7

[1] From national estimates based on detailed questionnaire database; subcategory-specific detail may not precisel match between tables due to rounding.
[2] Does not include data from three facilities in the former RT/PETR subcategory due to data confidentiality issues. Aver calculated without these three facilities.

TABLE 2-9

FACILITY EMPLOYMENT AND FACILITY EMPLOYMENT FOR TEC OPERATIONS BY SUBCATEGORY AND COMMERCIAL STATUS

Subcategory	Commercial			In-house		
	Number of Regulated Facilities[1]	Total Employment	Total TEC Employment	Number of Regulated Facilities[1]	Total Employment	Total TEC Employment
TT/CHEM&PETR	140	2,099	1,149	183	10,776	783
RT/CHEM&PETR[2]	18	463	188	22	1,728	88
TB/CHEM&PETR	12	599	437	3	109	61
Total[2]	170	3,161	1,774	208	12,613	932

[1] From national estimates based on detailed questionnaire database; subcategory-specific detail may not precisely match between tables due to rounding.
[2] Does not include data from three facilities in the former RT/PETR subcategory due to data confidentiality issues.

TABLE 2-10

FACILITY COSTS AND FACILITY COSTS FOR TEC OPERATIONS BY SUBCATEGORY

Subcategory	Number of Regulated Facilities[1]	Total Costs	Average Costs	Total TEC Costs	Average TEC Costs
TT/CHEM&PETR	322	$1,473,793,975	$4,577,000	$143,465,523	$445,545
RT/CHEM&PETR[2]	41	$174,516,119	$4,621,906	$25,450,700	$674,039
TB/CHEM&PETR	15	$50,230,171	$3,302,508	$43,809,939	$2,880,393
Total[2]	378	$1,698,540,265	$4,529,441	$212,726,162	$567,270

[1] From national estimates based on detailed questionnaire database; subcategory-specific detail may not precisel match between tables due to rounding.
[2] Does not include data from three facilities in the former RT/PETR subcategory due to data confidentiality issues. Averages are calculated without these three facilities.

TABLE 2-11

FACILITY COSTS AND FACILITY COSTS FOR TEC OPERATIONS BY SUBCATEGORY AND COMMERCIAL STATUS

	Commercial			In-house		
Subcategory	**Number of Regulated Facilities[1]**	**Total Costs**	**Total TEC Costs**	**Number of Regulated Facilities[1]**	**Total Costs**	**Total TEC Costs**
TT/CHEM&PETR	140	$254,717,176	$96,329,395	183	$1,219,076,800	$45,075,167
RT/CHEM&PETR[2]	18	$33,215,676	$16,499,120	22	$141,300,443	$8,345,434
TB/CHEM&PETR	12	$45,428,052	$40,879,723	3	$4,802,119	$2,930,217
Total[2]	170	$333,360,904	$153,708,238	208	$1,365,179,362	$53,350,818

[1] From national estimates based on detailed questionnaire database; subcategory-specific detail may not precisely match between tables due to rounding.
[2] Does not include data from three facilities in the former RT/PETR subcategory due to data confidentiality issues.

TABLE 2-12

FACILITY ASSETS BY SUBCATEGORY

Subcategory	Number of Regulated Facilities[1]	Total Assets	Average Assets
TT/CHEM&PETR	322	$720,290,653	$2,236,927
RT/CHEM&PETR[2]	41	$194,774,483	$5,158,431
TB/CHEM&PETR	15	$32,936,179	$2,165,471
Total[2]	378	$948,001,315	$2,528,004

[1] From national estimates based on detailed questionnaire database; subcategory-specific detail may not precisely match between tables due to rounding.
[2] Does not include data from three facilities in the former RT/PETR subcategory due to data confidentiality issues. Averages are calculated without these three facilities.

assets are attributable to non-TEC operations. Many facilities do not separately track TEC assets.[12] To obtain an approximate estimate of typical assets, EPA selected companies whose primary business is TEC and divided business assets by the number of facilities. In this example, typical assets are $1.2 million per facility.

The distinction between commercial and in-house facilities is important for the economic analysis. First, in-house tank cleanings do not represent a market transaction. Therefore, in-house facilities must be separated from commercial facilities in order to perform market analysis. The market analysis examines the impact of regulations on the price of cleanings and on the overall number of cleanings performed by the industry. Second, both types of facilities are providing the same service, but with different objectives; therefore; they may respond differently to EPA regulation. For commercial facilities, TEC operations are the primary business focus; however, to in-house facilities, TEC is an ancillary operation. In-house facilities may choose not to incur the incremental regulatory cost, and thus may close their TEC operation and out-source their TEC requirements to commercial facilities. This decision is analyzed in the market model. However, many in-house facilities have indicated that they will continue TEC operations and absorb the increased cost. Third, in-house facilities tend to be larger than commercial facilities; the agency is required to examine the potential impacts to small business entities, and such impacts are likely to be less severe for in-house facilities. This possibility is covered in more detail in Section 2.7.2.

2.5 COMPANY-LEVEL INFORMATION

2.5.1 Corporate Structure

The 109 facilities in the regulated subcategories sampled by the detailed questionnaire differ not only in size, but in corporate structure as well. As mentioned in Section 2.2, the survey was designed to sample at the facility level. Therefore, the analysis cannot estimate, with confidence, the total number of business entities that own TEC facilities. Thus, further discussion at the business entity level will be based on unweighted facility data.

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[12] Of 378 facilities, 78 do not track assets at the facility level; 145 do not track TEC assets at the facility level, and some do not track TEC assets at all.

The companies fall into several groups:

- # Those owning only one TEC facility, wherein the company is the facility.

- # Those that own only one TEC facility but that have other business operations in addition to the one TEC facility.

- # Those owning multiple TEC facilities.

The first group of business entities, wherein the company is equivalent to the facility, is the easiest to characterize. There are 38 facilities with this corporate hierarchy, of which 19 are potentially affected and 19 are ZDTs.

The second group is comprised of 17 companies. Of these, 9 facilities are potentially affected and 8 are ZDTs. The feature that distinguishes the second group from the first group is that facilities in the second group are owned by a corporate entity larger than the facility. This entity may well own other facilities; however, those facilities do not perform TEC operations. This distinction is significant because the Agency performed a small business analysis to determine that the Final Rule will not significantly impact a substantial number of small entities (Chapter 6). In the small business analysis, the size of the facility's parent business entity, not the size of the facility, is the relevant variable.

The third group of business entities are those that own multiple facilities that perform TEC operations. The remaining 54 facilities that received a detailed questionnaire are owned by 27 business entities; some business entities received multiple questionnaires while others received only one. Of the 54 surveyed facilities, 38 are potentially affected and 16 are ZDTs. These 27 business entities own a total of 204 TEC facilities; five business entities own between 15 and 30 TEC facilities each. These five business entities include both independent commercial TEC chains and large shipper/carrier firms with multiple sites. Because the status of the unsurveyed facilities is unknown, it is difficult to characterize any of these business entities as dischargers or zero dischargers. However, at least 29 of the business entities own at least one facility that discharges wastewater.

This group of multiple facility business entities represents a more complex problem for analysis. These businesses are less likely to be affected by small business considerations, however, the impacts due to compliance costs from all affected facilities must be estimated, not just the costs of surveyed facilities. Because some business entities own a large number of TEC facilities, aggregate compliance costs could be quite significant at the business entity level even if costs for individual facilities would not adversely impact those facilities.

2.5.2 Regulatory Flexibility Analysis and the Small Business Regulatory Enforcement Fairness Act (SBREFA)

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 (SBREFA), requires all federal agencies to certify that a rule or proposed rule will not have a significant impact on a substantial number of small entities, or provide a regulatory flexibility analysis. The RFA acknowledges that small entities have limited resources and makes it the responsibility of the regulating federal agency to avoid burdening such entities unnecessarily. 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). For small business concerns, the relevant entity is the business, not the facility. Thus, in the context of the TEC industry, it must be determined if a facility is owned by a small business entity, not if the facility itself is small.

The definition of “small” is generally defined by standards set by the Small Business Administration (SBA) according to SIC code. The TEC industry, however, cannot be defined by a single, or even a few, SIC codes. Furthermore, the SBA standards vary widely across the SIC codes reported by TEC facilities. Table 2-13 summarizes the SIC codes reported by TEC facilities, the SBA standard associated with that code, the number of (weighted) facilities reporting that code, and the number of (unweighted) business entities reporting that code. Note that small business standards range from $5 million to $20.5 million in annual revenues and from 100 to 1,500 employees.

The Agency's proposed guidance for SBREFA standards permits the selection of a single small business standard when an industry covers several SIC codes. Of the 10 different small business standards specified in the above table, 209 of 378 facilities in the analysis and 20 of 48 business entities report codes with $5 million given as the most appropriate standard. In addition, the $5 million standard is specified for the most relevant SIC code—7699 (Miscellaneous Services). This SIC code is assigned to facilities whose primary business activity is tank cleaning.

TABLE 2-13

**SBA STANDARDS BY 4-DIGIT SIC CODES
TECI REGULATED FACILITIES AND BUSINESS ENTITIES**

SIC Category		4-digit SIC code	SBA Standard*	Weighted Facilities	Unweighted Business Entities
15	Building Construction	1560	$17,000,000	3	1
37	Transportation Equipment	3715	500 emp.		1
		3731	1,000 emp.		1
		3732	500 emp.		1
		3743	1,000 emp.	2	1
		3799	500 emp.		1
39	Miscellaneous Manufacturing Industries	3930	750 emp.	7	1
42	Motor Freight Transportation & Warehousing	4200	$18,500,000	36	4
		4210	$18,500,000	14	1
		4213	$18,500,000	63	8
		4231	$5,000,000	52	4
44	Water Transportation	4463	$20,500,000	1	
		4491	$18,500,000	9	2
		4492	$5,000,000		1
		4499	$5,000,000	3	
47	Transportation Services	4700	$18,500,000	7	1
		4741	$5,000,000	13	4
		4785	$5,000,000	1	1
		4789	$5,000,000	7	
51	Wholesale Trade -- Nondurable Goods	5161	100 emp.	11	
		5172	100 emp.	9	2
63	Insurance Carriers	6338	$5m / 1,500 emp.	7	1
65	Real Estate	6599	$15,000,000		1
75	Automotive Repair, Services, and Parking	7513	$18,500,000		1
		7542	$5,000,000	22	2
76	Miscellaneous Services	7692	$5,000,000	1	1
		7699	$5,000,000	102	6
79	Amusement and Recreation Services	7966	$5,000,000	7	1
	Total	--	--	378	48

*Where SIC code reported incorrectly, SBA Standard from 2-digit or 3-digit level applied as appropriate.
Numbers may not sum to totals due to rounding.

With $5 million specified as the appropriate small business standard for the TEC industry, a total of 98 regulated facilities (with rounding) belong to business entities that are “small” (see Table 2-14). Of these 98 small potentially affected facilities, for 65 the facility is identical to the company. In addition, 75 of the 98 weighted facilities are considered commercial cleaners. This is relevant because only 170 of 378 affected facilities are commercial, thus 45 percent of commercial facilities are owned by small business entities. These small commercial businesses perform a large share of tank cleanings. The small business analysis is presented in Chapter 6.

2.6 MARKET PRICE AND QUANTITY

Because the market for TEC services is heterogeneous, baseline market conditions for each subcategory in the TEC industry were estimated by combining financial information from the Section 308 Survey with standard economic theory. The following description highlights key assumptions and results; details of the market model are presented in Chapter 3, and in Appendix B of the proposal EA report (U.S. EPA, 1998b).

The market for TEC services can be considered perfectly competitive on a national basis for the following reasons. First, a perfectly competitive market contains a large number of fairly similar firms, none of which is large relative to the size of the market. These two conditions make it difficult for any one firm to raise its product price because there are many other firms equally satisfactory to customers who will attract away customers from the first firm by maintaining their lower price; in other words, no single firm has “market power.” It is possible for a firm to have some localized market power if, for example, it has the only facility in a particular geographic region. Given the mobility of TEC customers, however, that is unlikely to be an important facet of this industry.

Second, for perfect competition to exist, there must be no barriers to entry. New firms must be able to easily enter the market in response to perceived opportunities to earn profits. The inability to prevent entry by new firms helps ensure market discipline. Barriers of entry can arise because of large capital requirements necessary to start a new company, patent rights on important production processes, or regulatory requirements. None of those conditions appear to exist in the TEC industry. There are, for example, no apparent barriers to purchasing or using cleaning technology, and no licensing requirements. Furthermore, capital requirements for starting up a TEC company do not appear particularly onerous.

TABLE 2-14

NUMBER OF REGULATED FACILITIES BY SUBCATEGORY, SMALL BUSINESS STATUS, AND COMMERCIAL STATUS

Subcategory	Regulated Facilities		Small Business Owned Regulated Facilities	
	Commercial	**In-house**	**Commercial**	**In-house**
TT/CHEM&PETR	140	183	60	20
RT/CHEM&PETR	18	22	9	3
TB/CHEM&PETR	12	3	6[1]	0[1]
Total	170	208	75	23

Numbers may not sum due to rounding.
From national estimates based on detailed questionnaire database; subcategory-specific detail may not precisel match between tables due to rounding.
[1] Results for small business owned direct dischargers only; results for indirect dischargers not included due to confide business information disclosure issues.

EPA obtained survey data on the book value of assets owned by companies with TEC facilities and analyzed the assets owned by that subset of TEC facilities that perform 100 percent commercial cleanings and for which TEC operations are the primary source of facility revenues. EPA examined this subset of facilities to provide the clearest estimate of capital requirements for TEC operations alone. This analysis showed that the typical TEC facility has a book value of fixed assets of approximately $1.2 million. It does not seem, therefore, that capital requirements for TEC are sufficiently large as to present a barrier to entry in comparison to other industries.

The supply of TEC services and the baseline equilibrium quantity of tanks cleaned in each subcategory were derived from survey data provided by facilities on the number and type of tanks cleaned and the revenues earned from tank cleaning operations. Only commercial facilities were included, as, by definition, in-house tank cleanings are nonmarket transactions. (However the market model does address the decision by in-house facilities to outsource TEC operations; see Chapter 3.)   The average revenue earned per cleaning is the facility's price. The highest facility price—the “marginal” price—becomes, by construction of the supply curve, the baseline equilibrium market price. The total weighted tank cleanings performed by facilities in the subcategory is the baseline equilibrium market quantity. Estimates of baseline price and quantity are presented by subcategory in Table 2-15.

The demand for TEC services is derived from the demand for transportation services. Demand for a product is best characterized by its elasticity. The price elasticity of demand is defined as the percentage change in quantity demanded caused by a 1 percent change in price. If demand is inelastic, the percentage change in quantity demanded is smaller than the percentage change in price; therefore total market revenues rise in response to an increase in price. The opposite relationship holds if demand is elastic. According to the results of the literature search, the best estimates for transportation services are that the demand for rail services is approximately unit elastic (a 1 percent change in price causes a 1 percent change in quantity demanded) while the demand for trucking services is slightly more elastic and the demand for water-borne services is slightly less elastic.

The price elasticity of demand for TEC services is derived from the estimates of demand elasticity for transportation services using a standard, well-defined economic relationship. The derived demand for this service is a function of the demand for the primary service (transportation), the cost share of TEC out of total transportation cost, and the availability of substitutes for TEC. According to survey data from facilities operated by carriers, the cost of TEC services is less than 10 percent of the

TABLE 2-15

BASELINE COMMERCIAL EQUILIBRIUM PRICE AND TANK CLEANINGS BY SUBCATEGORY

Subcategory	Equilibrium Price	Equilibrium Tank Cleanings
TT/CHEM&PETR	$279	774,406
RT/CHEM&PETR	$781	32,989
TB/CHEM&PETR	$6,448	12,078

Estimated equilibrium prices and quantities are based on Section 308 survey data and calculations from the TECI market model.

total cost of providing transportation services; some survey respondents reported that the cost of TEC is so small it is not tracked.

There are relatively few good substitutes available for TEC services. The need for tank cleanings can be minimized by the use of dedicated tanks or the use of tank liners. Tank liners are a relatively recent development and have not become a significant option for operators (Modern Bulk Transporter, 1994). The use of dedicated tanks would require a large increase in investment by operators, as many more tanks would be required to provide the same level of services.

The low cost share for TEC services in the provision of transportation services combined with a lack of good substitutes for TEC services results in an extremely inelastic demand for TEC services. The lack of substitutes means the costs of TEC are essentially unavoidable. The low cost share means that operators do not have incentives to expend significant resources in finding a means to minimize TEC costs.

The significance of inelastic demand for TEC services is that TEC facilities will be more able to bear the burden of increased regulatory cost than if demand were elastic. Because demand is inelastic, the increased cost of providing TEC services can, in part, be passed on to customers in the form of higher prices rather than be paid for out of company profits. Companies can increase revenues by increasing price to help pay the regulatory cost; facilities will be less likely to be forced into closure. If demand is price elastic, an increase in price will decrease revenues, and more of the regulatory cost would be borne by the company.

In the case of the TEC industry, however, a second influence works against the effects of inelastic demand. The existence of commercial facilities with zero or low flow wastewater discharge will limit the ability of firms to increase price. These ZDT and low flow facilities will incur no regulatory costs and therefore will have less incentive to increase price; they can attract customers away from the now higher-priced competitors. Because commercial ZDT and low flow facilities are a distinct minority in the market, they are unlikely to be able to provide all commercial cleanings and some price increase will occur in the market. However, the existence of these facilities will prevent prices from increasing as much as they would in the absence of ZDT and low flow facilities. The market model accounts for this behavior (see Chapter 3 and the proposal EA report, U.S. EPA, 1998b).

Finally, there is another significant implication of the small cost share of TEC operations. In theory, truck, rail, and barge transportation are substitutes for each other. In practice, choice of transportation mode may be limited by other factors. Barge transportation is by far the cheapest mode in terms of cost per ton-mile; however, geography and speed are important determinants of when it is chosen. Rail has a lower cost per ton-mile than trucks, but when the cost of yard operations is included, rail service cannot compete with truck service over short distances and only has a competitive advantage over trucks on long hauls.

Because the transportation modes are, at least in some circumstances, competitors, costs imposed on one mode provide incentive for shippers to substitute other modes for transport services. In theory, the proposed effluent guideline could cause such a substitution. However, TEC service for all three modes is subject to the regulation. Also, the cost of TEC services comprises a very small share of the cost of transportation services. It would, in practice, take an extremely large differential in cost per cleaning imposed on different modes to have a large enough impact on the differential in each mode's overall costs of providing transportation services to cause a shipper to switch between transportation modes. The likelihood of such substitution effects is very small. For that reason, EPA has analyzed the TEC market subcategories as if they are independent of each other.

2.7 INDUSTRY GROWTH

The heterogeneous nature of the TEC industry means that reliable published data on the growth rate of the industry is unavailable. EPA used two sources to estimate industry growth: data from the detailed questionnaire, and published data on the growth of the transportation services industry.[13] Because the demand for TEC services is derived from the demand for transportation services, the long-run growth rate of the TEC industry should be similar to that of the transportation services industry.

Table 2-16 presents data on TEC industry growth derived from the detailed questionnaire. A total of 67 potentially affected facilities (9.6 percent of discharging facilities) and 84 total facilities (6.8 percent of total facilities) opened in the 1992 to 1994 period covered by the questionnaire. The majority of these new facilities were commercial. New discharging facilities accounted for $155 million in

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[13] Data from discharging facilities are included, since the information used for estimating industry growth is limited.

TABLE 2-16

TEC INDUSTRY GROWTH

TEC Facility Growth			
	Number of Discharging Facilities[1]	**Number of ZDT Facilities**	**Total Number of Facilities**
New Facilities	67	17	84
New Commercial Facilities	50	--	50
New Facility Revenues	$154,619,312	$27,932,593	$182,551,905
New Facility Employment	1,547	394	1,941
New Facility Tank Cleanings	342,976	5,543	348,519
TEC Tank Cleaning Growth			
	1992	1993	1994
Tanks Cleaned by Potentially Affected Facilities	1,101,765	1,352,004	1,619,552
% Change	--	22.7%	19.8%
Tanks Cleaned by ZDT Facilities	453,954	439,121	455,791
% Change	--	-3.3%	3.8%
Tanks Cleaned by All Facilities	1,555,719	1,791,125	2,075,343
% Change	--	15.1%	15.9%

Note: Tanks cleanings performed in 1994 do not match numbers reported in Table 2-4. Some facilities that were open and 1993 were unable to report the number of tank cleanings they performed. These facilities were removed fro estimates above in order to avoid overestimating the growth in tank cleanings.

[1]From national estimates based on detailed questionnaire database.

industry revenues, provided 1,550 new jobs, and cleaned 343,000 tanks in 1994. All new facilities identified in the detailed questionnaire opened in 1993.[14]

An industry can grow through an increase in production at existing facilities as well as through the opening of new facilities. An estimate of the increase in annual tank cleanings performed captures both types of growth and therefore provides a better sense of overall industry growth. This estimate is provided in the bottom of Table 2-16. Tank cleanings per year performed by potentially affected facilities grew by approximately 23 percent in 1993 and 20 percent in 1994. Because the growth in cleanings provided by ZDT facilities was much smaller than that for potentially affected facilities, the overall average growth rate for the entire TEC industry, as measured by this method, was approximately 15 percent in 1993 and 16 percent in 1994.[15]

Table 2-17 presents two estimates of the growth in the transportation services industry. The first estimate is based on Department of Transportation data on ton-miles of freight transported (U.S. Department of Transportation, 1997). Overall, ton-miles of freight carried grew by 3.5 percent in 1992, less than 1 percent in 1993, and 6 percent in 1994. The second estimate uses Bureau of Economic Analysis data (U.S. Department of Commerce, 1996) on real output by industry for SIC codes 40 (railroad transportation), 42 (trucking and warehousing), and 44 (water transportation). These data indicate that the transportation services industry grew by almost 4 percent in 1992, 6 percent in 1993, and 7 percent in 1994.

Several factors might contribute to this difference between estimates of the growth in tank cleanings performed and estimates of the growth in transportation services:

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[14] The sources used to provide the sampling frame for the screener survey were published in 1992 and 1993; the detailed questionnaire sample was drawn from the subset of screener survey facilities deemed in-scope for the proposed TEC regulation on the basis of their responses (U.S. EPA, 1998c). Therefore, a facility which opened in 1994 could not have received a detailed questionnaire.

[15] Several facilities indicated in the detailed questionnaire that they could not provide data on tank cleanings performed in 1992 or 1993. In order to avoid overestimating the growth rate for 1994, these facilities were not included in the analysis. The analysis provided in Table 2-16 implicitly assumes that the number of tank cleanings performed at the excluded facilities grew at the same rate as the number of tank cleanings at the included facilities. In addition, the total number of tank cleanings provided in Table 2-16 is smaller than the number of tank cleanings provided in Table 2-4.

TABLE 2-17

TRANSPORTATION SERVICES GROWTH, 1991 - 1994

By Ton-Miles of Freight (millions)								
Year	Intercity Trucking	% Growth	Class Railroads	% Growth	Domestic Waterborne[1]	% Growth	Total	% Growth
1991	758,000	--	1,038,875	--	847,431	--	2,644,306	--
1992	815,000	7.52%	1,066,781	2.69%	855,735	0.98%	2,737,516	3.52%
1993	861,000	5.64%	1,109,309	3.99%	788,736	-7.83%	2,759,045	0.79%
1994	908,000	5.46%	1,200,701	8.24%	813,626	3.16%	2,922,327	5.92%
By Value-Added (Billions of 1992 dollars)[2]								
Year	Trucking & Warehousing	% Growth	Railroad	% Growth	Water Transportation	% Growth	Total	% Growth
1991	$77.9	--	$21.9	--	$10.7	--	$110.5	--
1992	$82.2	5.52%	$22.1	0.91%	$10.3	-3.74%	$114.6	3.71%
1993	$88.4	7.54%	$23.0	4.07%	$10.3	0.00%	$121.7	6.20%
1994	$95.1	7.58%	$24.3	5.65%	$10.6	2.91%	$130.0	6.82%

[1] Sum of coastwise, lakewise, and internal shipping, excluding intraport shipping.

[2] SIC codes: 40 - Railroad Transportation, 42 - Trucking and Warehousing, and 44 - Water Transportation.

Sources: U.S. Department of Commerce, 1996; U.S. Department of Transportation, 1997.

Several TEC facilities indicated on the detailed questionnaire that they estimated the number of tank cleanings performed in 1992 or 1993; if these facilities underestimated tank cleanings performed in those years, and excluded facilities grew at a lower rate than other facilities, Table 2-16 would overestimate the growth in tank cleanings.

The ton-miles and real output data are aggregate measures of transportation services provided; within each transportation group, tank transportation services may have grown faster than other transportation services. Table 2-17 would underestimate the growth of transportation services that require tank cleaning.

Changes in tank cleaning policy may have occurred that could have affected tank cleaning frequency (e.g., a change in government regulations may have required more frequent tank inspections, or shippers may have required more frequent tank cleaning to ensure product quality). Such changes could cause tank cleanings performed to grow at a faster rate than tank transportation services provided.

Although in the long run the growth rates of transportation services and TEC services should be comparable, their growth rates may not be comparable in any specific year.

EPA believes the estimated growth rate in tank cleanings presented in Table 2-16 provides an upper bound estimate of the TEC industry growth rate. The estimated growth rate for transportation services presented in Table 2-17 provides a lower bound estimate of the TEC industry growth rate; the true value for growth in TEC services lies between the upper and lower bounds.

2.8 INTERNATIONAL COMPETITIVENESS

International trade issues are not considered significant for the TEC industry. Although, in theory, carriers could substitute Canadian or Mexican TEC services for U.S. services, such substitutions are unlikely in practice. First, foreign facilities would be too inconvenient for the vast majority of tank operators. Second, the opportunity cost in terms of transit time of a border crossing solely for the purpose of obtaining TEC services is likely to be prohibitive.

Increasing TEC prices could potentially have an effect on transported products that may be subject to international trade. However, TEC services make up a small fraction of the cost of transportation services, and transportation services comprise only a fraction of the cost of the final demand product in the marketplace. Any impact of increasing TEC prices is likely to have a negligible effect on the price of internationally traded products.

2.9 REFERENCES

Modern Bulk Transporter. 1994. Environmental Linings, Inc., provides disposable tank liners. Modern Bulk Transporter. Houston, TX. May:154.

SAIC. 1997. Preliminary national estimates from Parts A and B of detailed questionnaire for TEC and ZDT facilities; separately and combined. Prepared for U.S. Environmental Protection Agency, Office of Water, by SAIC. McLean, Virginia. May 7.

U.S. Bureau of the Census. 1996. County business patterns, 1994. Washington, DC: U.S. Government Printing Office. October.

U.S. Department of Commerce. 1996. Improved estimates of gross domestic product by industry, 1959-1994. Survey of Current Business. 76(8):133.

U.S. Department of Transportation. 1997. National transportation statistics, 1997. Table 1-9. Available at http://www.bts.gov/btsprod/nts. Washington, DC: U.S. Department of Transportation, Bureau of Transportation Statistics.

U.S. EPA. 1993. Tank and container interior cleaning screener questionnaire. OMB No. 2040-0166. Washington, DC: U.S. Environmental Protection Agency, Office of Water.

U.S. EPA. 1995. 1994 Detailed questionnaire for the transportation equipment cleaning industry. OMB No. 2040-0179. Washington, DC: U.S. Environmental Protection Agency, Office of Water. April.

U.S. EPA. 1998a. Development Document for Proposed Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA 821/B-98-011. Washington, DC: U.S. Environmental Protection Agency, Office of Water. May.

U.S. EPA. 1998b. Economic Analysis of Proposed Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA 821/B-98-012. Washington, DC: U.S. Environmental Protection Agency, Office of Water. May.

U.S. EPA. 1998c. Statistical Support Document of Proposed Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA 821/B-98-014. Washington, DC: U.S. Environmental Protection Agency, Office of Water. May.

U.S. EPA. 2000. Development Document for the Final Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA-821-R-00-012. Washington, DC: U.S. Environmental Protection Agency, Office of Water. June.

CHAPTER 3

ECONOMIC IMPACT ANALYSIS METHODOLOGY OVERVIEW

The economic impact methodology for the TEC industry effluent limitations guidelines and standards is designed to compare conditions in the industry before and after the Final Rule. The methodology uses several measures to assess economic impacts on the industry. These measures include facility closures, financial stress, employment losses, revenue losses, secondary impacts, price changes, and output changes.

The measures are generated by several economic and financial models. This chapter summarizes the models used in the economic impact analysis. The economic impacts are evaluated using the following five models and methods:

- Cost annualization model
- Market model (consisting of a commercial component and an outsourcing component)
- Closure model
- Financial ratio analysis
- Secondary impacts analysis

The methodology used for these models is described in detail in Appendices A through E of the *Economic Analysis of Proposed Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry* (U.S. EPA, 1998).

The cost annualization model (Appendix A, proposal EA report, U.S. EPA, 1998) uses engineering estimates of capital and annual operating and maintenance costs to calculate total compliance costs over the 16-year project lifetime; these costs are used both to estimate the incremental cost-effectiveness of pollutant removal technologies (see Chapter 4 of this document, and the Cost-effectiveness Document, U.S. EPA, 2000) and as inputs into the remaining models, which project the economic impacts of the regulation.

The market model analyzes two separate and distinct market components of the TEC industry. The commercial component of the market model (Appendix B, proposal EA report, U.S. EPA, 1998) estimates the impact of compliance costs on overall cleanings performed and market price; it does not estimate impacts to the individual commercial facilities that perform the cleanings. That is, the market model estimates the aggregate decrease in tank cleanings performed by a subcategory. The market model does not estimate if the post-compliance decline in tank cleanings is due to the closure of one or more facilities or to a small decrease in cleanings among many facilities. The market model also examines the decision by in-house facilities to either upgrade their TEC wastewater treatment systems, or to close their TEC operations (but not the entire facility) and outsource their tank cleaning requirements to commercial facilities.

The closure model (Appendix C, proposal EA report, U.S. EPA, 1998) addresses of the impact of compliance costs on the cash flow of individual facilities. In effect, the closure analysis models the financial evaluation a facility owner might make when deciding whether to upgrade pollution controls or close the facility.

The financial ratio analysis (Appendix D, proposal EA report, U.S. EPA, 1998) examines whether a company can afford the cost of upgrading all of the TEC facilities that it owns.[1] Companies that own more than one TEC facility may not able to afford the total cost of upgrading all the facilities, even if it makes economic sense to each individual facility. Many banks use financial ratio analyses to assess the credit worthiness of a potential borrower. If the incidence of regulatory costs causes a company's financial ratios to move into an unfavorable range, the company will find it more difficult to borrow money. Under these conditions, EPA considers the company and each facility that it owns to be experiencing "financial distress short of closure."

The secondary impacts analysis (Appendix E, proposal EA report, U.S. EPA, 1998) assesses national and regional output and employment impacts resulting from compliance with the proposed effluent limitations guidelines for the TEC industry. Compliance costs decrease the output of the TEC industry, which may cause a loss in TEC employment. The decrease in TEC output decreases the

[1] The closure model examines whether it makes economic sense to upgrade a given facility (e.g., whether the facility could absorb the additional costs and still remain profitable). It does not examine whether the company can raise the capital to make that investment. The financial ratio analysis examines the post-regulatory credit worthiness of the company.

demand for products in the industries that supply inputs to the TEC industry. As a result, these industries may suffer reduced output and employment as well. However, the need to manufacture, install, operate, and maintain the pollution control equipment may generate increased economic activity in other industries. This increase in economic activity resulting from compliance with the regulation can result in output and employment gains that offset the losses caused by the regulation. The impacts of the TEC regulation on output and employment in non-TEC industries are called secondary impacts.

Although there are points of interaction between these five models, each model provides a different perspective on the industry and the impacts potentially caused by the effluent limitations guidelines requirements. Section 3.1 presents the cost annualization model. Section 3.2 presents the market model and discusses the estimation of cost pass through, which is used to link between the market-level and facility-level analysis under a positive cost pass through scenario. Section 3.3 describes the facility closure model, while the estimation of financial distress is presented in Section 3.4. Section 3.5 presents the methodology for estimating secondary impacts.

3.1 COST ANNUALIZATION MODEL

EPA uses the cost annualization model to estimate the annualized and present value of total capital costs and operating and maintenance costs for new pollution control equipment. Costs are annualized for two reasons. First, the initial capital outlay should not be compared against the facility's income in the first year because the capital cost is incurred only once in the equipment's lifetime. Therefore, the initial investment should be spread out over the equipment's life. Second, money has a time value: a dollar today is worth more than a dollar in the future.

The cost annualization model is defined in terms of 1994 dollars because 1994 is the most recent year for which financial data are available from the survey (U.S. EPA, 1995a). The model evaluates what each facility would pay in 1994 dollars for all initial and future expenditures. Finally, the model calculates the annualized cost for the cash outflow as an annuity that has the same present value as the stream of cash outflow and includes the cost of money or interest. The annualized cost is analogous to a mortgage payment that spreads the one-time investment of a home over a series of constant monthly payments.

Figure 3-1 is an overview of the cost annualization model. Inputs to the model come from three sources: (1) the capital and annual costs for incremental pollution control developed by the Agency, (2) financial assumptions based on secondary sources, and (3) financial data taken from the 1994 Questionnaire. The cost annualization model calculates four types of compliance costs for a facility:

- Present value of expenditures—before-tax basis
- Present value of expenditures—after-tax basis
- Annualized cost—before-tax basis
- Annualized cost—after-tax basis.

Section 3.1.1 discusses the data sources for the cost annualization model; Section 3.1.2 summarizes the financial assumptions in the model; and Section 3.1.3 presents all steps of the model with a sample calculation.

3.1.1 Input Data Sources

The *capital* and *operating and maintenance* (O&M) costs used in the cost annualization model were developed by EPA's engineering staff. The capital cost is the initial investment needed to purchase and install the equipment; it is a one-time cost. The O&M cost is the annual cost of operating and maintaining the equipment. O&M costs are incurred every year of the equipment's operation.

The *depreciable life of the asset* is based on information in the 1994 Questionnaire and the Internal Revenue Code.

The *discount/interest rate* is either the discount rate or the interest rate that the facility supplied in the 1994 Questionnaire (as long as it falls between 3 and 19 percent)—whichever is higher. It is used in calculating the present value of the cash flows. The discount rate represents an estimate of the facility's marginal cost of capital (i.e., what it will cost the facility to raise the money either through debt (a loan), equity (sale of stock), or working capital (opportunity cost)). For companies that do not use a discount rate, the interest rate is used in the calculations. Where a facility-specific interest rate is available (and is between 3 and 19 percent), that facility-specific rate is used in the cost annualization

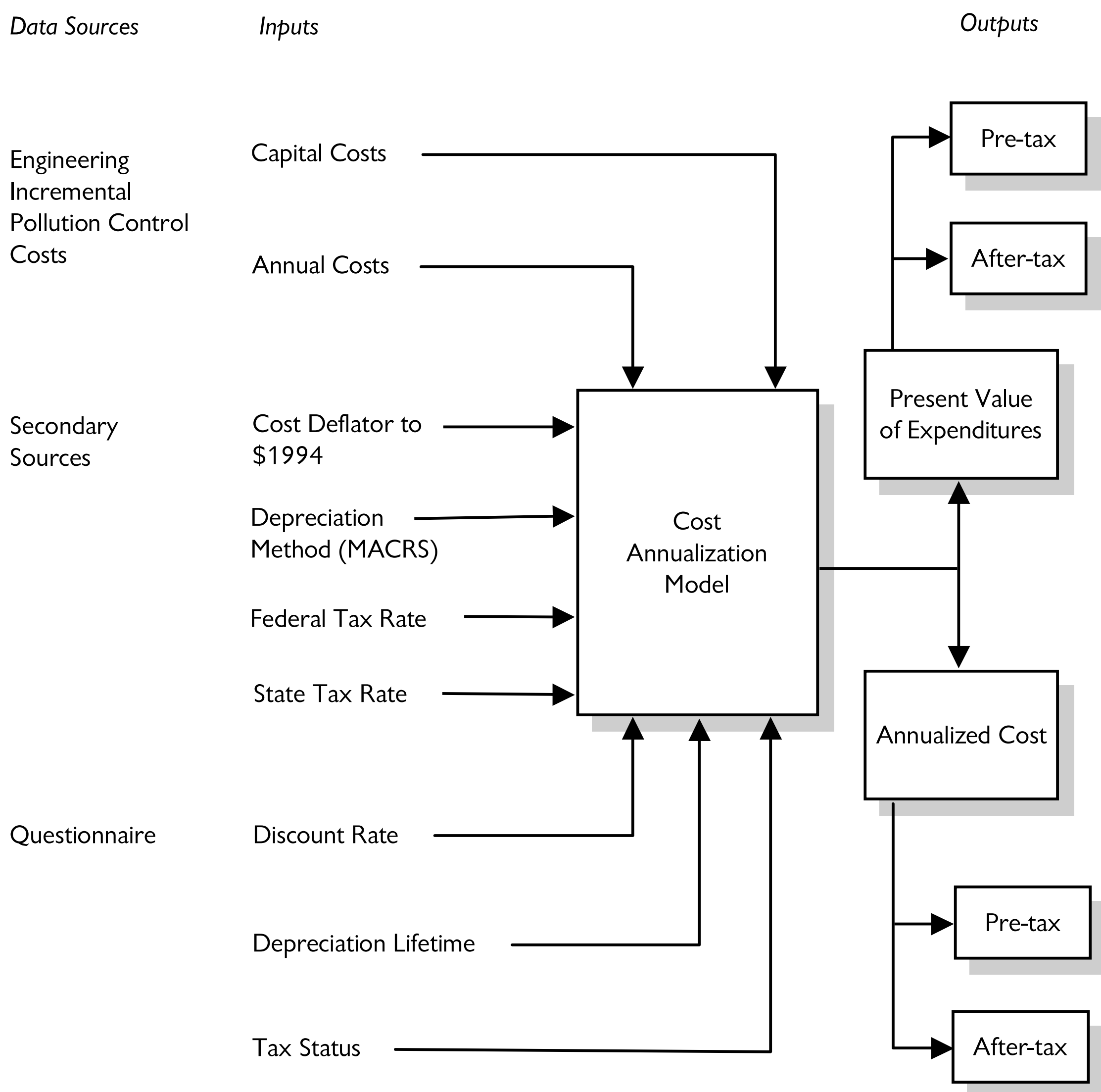


Figure 3-1

Cost Annualization Model

model; if such a rate is not available (or falls outside that range), the industry average discount rate of 10.4 percent is used instead.[2]

The tax rate used to calculate the tax shield on compliance cost expenditures is determined by the *corporate structure* and *taxable income*, both of which are supplied in the 1994 Questionnaire. Corporate structure identifies whether the facility pays taxes at the corporate or individual rate. The amount of taxable income identifies the tax bracket of the facility; the tax bracket is determined by the taxable income of the parent business entity, not the facility. 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. To address differences between small and large businesses, the cost annualization model incorporates variable tax rates according to the type of business entity and level of income. The closure analysis uses after-tax cost because it reflects the impact the business would actually feel in its net income.

3.1.2 Financial Assumptions

The cost annualization model incorporates several financial assumptions:

- *Depreciation method.* The cost annualization model uses the Modified Accelerated Cost Recovery System (MACRS). 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 may be reduced under MACRS by a greater amount in the early years when the time value of money is greater.

- *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. 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. Thus the cost annualization model spans a 16-year period.

[2] A rate less than 3 percent is suspiciously low given that, in 1994, banks charged a prime rate of 7.15 percent and the discount rate at the Federal Reserve Bank of New York was 3.6 percent (CEA, 1995). A rate greater than 19 percent is more likely to be an internal "hurdle" rate—the rate of return required for a project to be undertaken.

- # *Depreciable lifetime for equipment.* An asset's depreciable life can differ from its actual service lifetime. Equipment with a 20-year lifetime—typical of many pollution control components—is considered 15-year property. In addition, the Internal Revenue Code, Section 168, lists a municipal wastewater treatment plant as an example of 15-year property (IRS, 1995). The cost annualization model, therefore, incorporates a 15-year lifetime.

- # *Tax shields on interest payments.* To maintain a conservative estimate of the after-tax annualized cost, tax shields on interest payments are not included in the cost annualization model. 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.

- # *Discount rates.* EPA uses either the interest rate or the discount rate provided by the facility in the cost annualization model—whichever is higher. This decision assigns the higher rate to the opportunity cost for internal financing. The decision will lead to a slightly higher annualized cost if only debt or a mix of debt and internal funding is used to raise the capital. The decision, however, will not underestimate industry compliance costs or impacts.

3.1.3 Sample Cost Annualization Spreadsheet

Table 3-1 presents a sample cost annualization spreadsheet that calculates the before- and after-tax annualized costs of the pollution control investment to the facility. The after-tax annualized cost reflects what a business actually pays to comply with incremental pollution control requirements and is used to calculate the cost of the regulation. The before-tax annualized cost is used in calculating calculate cost-effectiveness, in the outsourcing component of the market model, and in the financial ratio analysis. The after-tax present value of incremental pollution control expenditures is used in the closure analysis.

3.2 MARKET METHODOLOGY

A market model consisting of two components, the commercial component and the outsourcing component, was used to analyze supply and demand within the TEC industry. A market analysis is appropriate only for TEC facilities that offer commercial services because market interactions can only

TABLE 3-1
SPREADSHEET FOR ANNUALIZING COSTS

INPUTS

Survey ID #:	1234					
Option Number:	OPTION Q					
	1994	1994			Engineering Inputs	Economic Analysis
Initial Capital Cost ($):	$100,000	$100,000	Year Dollars		1994	1994
Annual Operation & Maintenance Cost ($):	$10,000	$10,000	ENR CCI		5439	5439

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%

Federal Corp.Tax Table: Taxable Income ($)	Average Effective Tax Rate	Federal Personal Tax Table: Taxable Income ($)	Average Effective Tax Rate
$0	15.0%	$0	15.0%
$50,000	16.7%	$22,750	18.8%
$75,000	20.4%	$55,100	24.8%
$100,000	28.3%	$115,000	29.5%
$335,000	34.0%	$250,000	37.8%

Column 1	2	3	4	5	6	7	8
Year	Depreciation Rate	Depreciation for Year	Tax Shield From Depreciation	O&M Cost	O&M Tax Shield	Cash Outflow	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 10.4% is used.
First Year is not discounted.

be analyzed where prices and quantities are observable. In-house facilities perform TEC for themselves and claim another business operation as their primary focus; in-house facilities thus perform most, and perhaps all, of their cleanings without a market transaction. These facilities can, however, choose to meet their TEC needs by outsourcing their cleanings to a commercial facility—a strategy that would impact the market analysis. The market model therefore incorporates these in-house, noncommercial facilities through an outsourcing module.

Output from the market model includes:

- An estimated post-regulatory commercial price and quantity for each market group.
- A percentage cost pass through for each commercial market group, to be used in the closure analysis.
- The estimated magnitude of line closures within in-house facilities deciding to outsource.
- Revised estimates of total annualized costs for in-house facilities deciding to outsource, for use in the closure analysis.

Non-commercial, in-house facilities are analyzed in the market model to the extent that they may provide a small number of commercial cleanings; the calculations of the market model encompass only the commercial portion of the industry.

Section 3.2.1 presents a graphical overview of the commercial market. Sections 3.2.2 summarizes how EPA estimates preregulatory market conditions, while section 3.2.3 describes the shift in the supply function resulting from compliance costs.

3.2.1 Graphical Overview of Commercial Market Changes

The market impacts of the Final Rule on the TEC industry will depend on the extent to which cost increases: (1) cause a decline in the quantity of tank cleanings performed, and (2) can be passed on to consumers through higher prices. Tank cleanings are inputs into the service of transportation, and transportation is an input into the product it delivers. Therefore, the demand for cleaning ultimately depends on the demand for the final products delivered by the transportation industry.

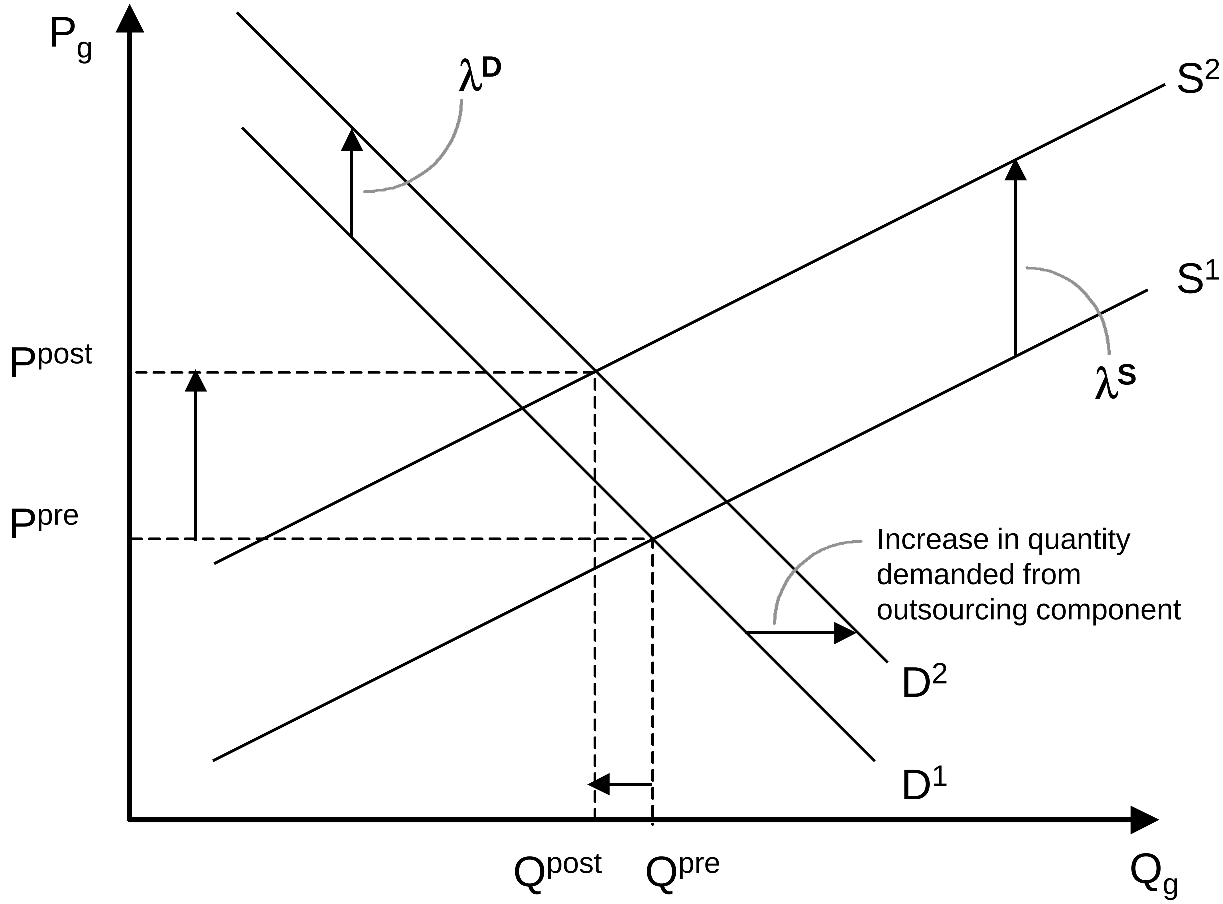
Figure 3-2 illustrates a commercial market for TEC. Preregulatory conditions are shown by S^1 (supply), D^1 (demand), and equilibrium (their intersection) at P^{pre} and Q^{pre} (price and quantity). Imposing the effluent guideline causes an increase in the cost of providing TEC services. This changes the commercial TEC supply curve, shifting it upwards (to the left); the supply shift is shown as 8^S in Figure 3-2. At the same time, the cost of in-house cleaning, a substitute service, increases. Therefore, the potential exists for facilities to switch from providing the service for themselves to outsourcing their TEC needs into the commercial market. If in-house facilities do switch to commercial providers, the demand curve in the commercial TEC market groups shifts upwards (to the right). This demand shift is derived from the outsourcing component of the model. The change in price due to this outsourced quantity is shown as 8^D.

At the intersection of the new supply and demand curves, S^2 and D^2, Figure 3-2 shows the postregulatory equilibrium at a higher price and lower quantity, P^{post} and Q^{post}, than the preregulatory equilibrium of P^{pre} and Q^{pre}. Because the regulation would change both the supply and demand for commercial services, however, the change in quantity cannot be predicted; the only predictable movement is an increase in price. Figure 3-2 can be redrawn to show an increased or an equivalent postregulatory quantity compared to the preregulatory environment. The actual result would depend on the relative magnitudes of the supply and demand function shifts. The market analysis could show an overall increase in the amount of business realized by commercial TEC facilities. This would occur if the amount of cleanings outsourced to the commercial market (the change in demand) exceeds the decline in cleanings due to increases in price (the change in supply).

3.2.2 Estimating Preregulatory Commercial Market Conditions

The demand and supply curves need to be estimated prior to the imposition of regulatory costs in order to estimate baseline industry conditions. The change from the baseline, or preregulatory, market conditions is a measure of the impacts caused by increased pollution control costs. Both the commercial supply and the commercial demand equations can be estimated with information from the detailed questionnaire and other sources. Commercial TEC supply is a function of the price of commercial TEC service and the regulatory compliance cost (which is zero under preregulatory conditions). Commercial TEC demand is a function of the price of commercial TEC services and the cost and availability of substitute services (e.g., in-house provision). Both the supply and demand equations are also functions of

TEC COMMERCIAL MARKET GROUP g



D^1, S^1 = preregulatory market conditions
D^2, S^2 = postregulatory market conditions
P^{pre}, Q^{pre} = pre-requlatory equilibrium price and quantity
P^{post}, Q^{post} = post-requlatory equilibrium price and quantity
λ^S = supply shift = weighted average increase in marginal cost from regulation
λ^D = demand shift = change in price due to change in quantity demanded

Figure 3-2

Impact of the Effluent Guideline on a Commercial Market With Outsourcing other exogenous variables, such as the price of inputs to provide TEC, the number of annual tank inspections, and the commodities transported. These variables are assumed to be unaffected by the regulation and are therefore considered exogenous; exogenous variables enter the market model through the constant terms in the demand and supply equations.

Due to the limited amount of time-series data available from industry and other sources, traditional methods for estimating supply and demand functions are not feasible. Figure 3-3 is a flow diagram of the steps necessary to obtain quantitative estimates of the supply and demand for commercial facilities. The process begins with identifying commercial facilities and weighting questionnaire data from the facility level to the market level. The process continues with grouping data by mode of equipment cleaned, and estimating the supply and demand elasticities.

The price elasticities of supply and demand are two of the key parameters for estimating market level impacts.[3] The price elasticity of supply is estimated econometrically from weighted questionnaire data on commercial tank cleanings and facility revenues. The price elasticity of demand is derived from published studies of the price elasticity of demand for transportation services and from questionnaire data on the cost of TEC operations as a percentage of the total costs of transportation services. Appendix B of the proposal EA report contains a summary of the literature search results for studies of the price elasticity of demand for transportation services (U.S. EPA, 1998).

3.2.3 Estimating the Shift in the Supply Function From Compliance Costs

After the effluent guideline is promulgated, the supply function will shift because pollution control costs are higher. The per unit cost increase may differ for each firm and may not be correlated with firm size or price. Therefore, to calculate the shift in the supply function, EPA uses the expected value of the change in marginal cost for the given market group. The expected shift of the supply

[3] The price elasticity of demand/supply is defined as the percentage change in quantity demanded/supplied caused by a 1 percent change in market price. The relative elasticities of supply and demand determine whether market impacts fall primarily on the price of tank cleaning or on the quantity of tank cleanings performed. This can be observed in Figure 3-2 by comparing impacts when the demand curve is steep (relatively inelastic) with impacts when the demand curve is flat (relatively elastic). For the same upward shift in the supply curve, the impact will fall primarily on price, with little effect on the number of tank cleanings performed, when demand is relatively inelastic; the impact will fall primarily on quantity, with little effect on price, when demand is relatively elastic.

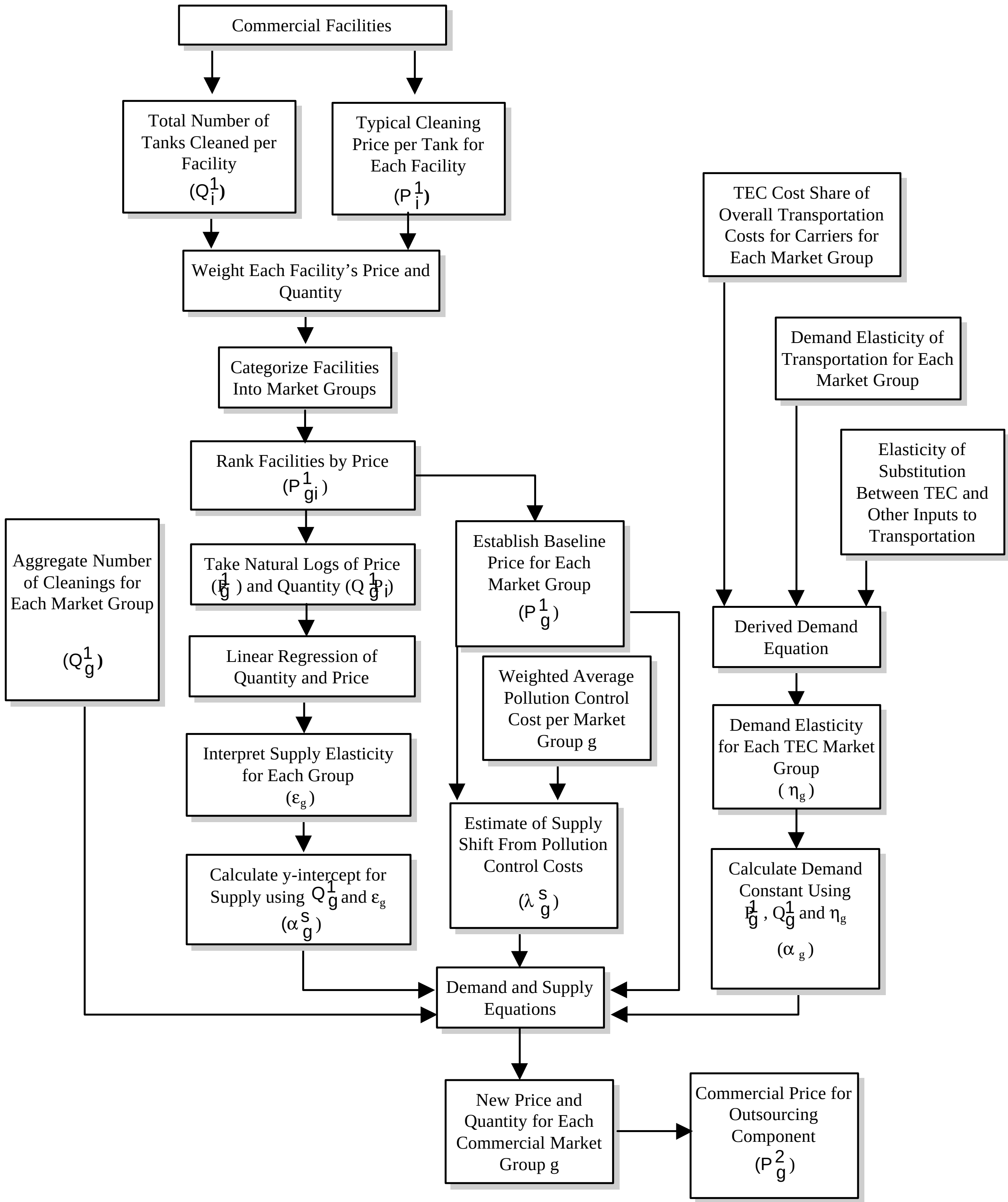


Figure 3-3

Commercial Component for TEC Market Model function is equal to a weighted average of the facility-specific pollution control costs per unit of output. The entire supply curve shifts upwards (i.e., to the left).

The new equilibrium quantity and price after this shift in supply may be an intermediate equilibrium. It is an equilibrium: quantity supplied equals quantity demanded by those currently participating in the commercial market at the going market price P^2. However, it is an interim equilibrium in the sense that in-house providers of TEC services may now have incentive to outsource their TEC needs. If any of these facilities choose to enter the commercial market, the demand curve will shift and the market will move to a new equilibrium point (see Figure 3-2). The market will not be in final equilibrium until all demanders and suppliers of TEC services, both commercial and in-house, no longer have any incentive to change their behavior at the existing market price.

Figure 3-4 illustrates the logic flow for the outsourcing component. The outsourcing module calculates the relative increase in cleaning cost for in-house facilities, compares it to the facility's willingness to switch to commercial cleaning (obtained from questionnaire data), calculates the cost of having the same cleaning performed commercially, and determines whether or not the facility would outsource its cleaning.

After the postregulatory price and quantity are determined, a cost pass through percentage (CPT) can be calculated for use in the closure model. CPT is the difference between the baseline and postregulation prices as a proportion of the average pollution control cost per unit. CPT estimates the relative burden of the cost of the regulation borne by the producers and consumers of TEC services by determining what percentage of pollution control costs is actually paid by the facility, and what percentage of those costs the facility may recover by passing them along to consumers in the form of higher prices. Each market group will have a different CPT.

3.3 CLOSURE MODEL

EPA developed a financial model to estimate whether the additional costs of complying with the proposed regulation cause operating costs to exceed revenues for a TEC facility. If so, the facility is projected to close as a result of the regulation, leading to facility-level impacts such as losses in

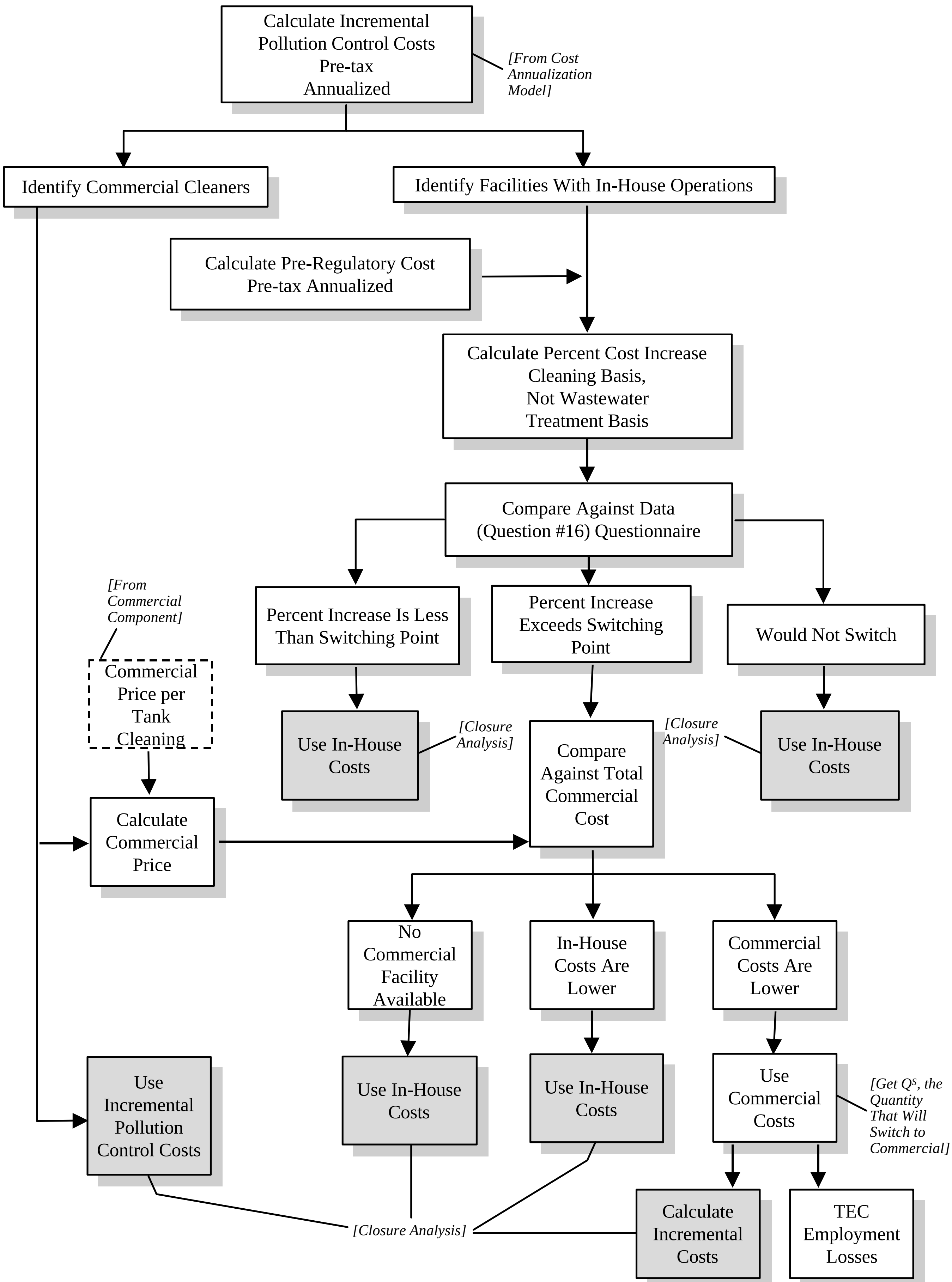


Figure 3-4

Outsourcing Component of TEC Market Model employment and revenue. The model is based on facility-specific data from the detailed questionnaire (U.S. EPA, 1995a) because such data are not available elsewhere.

The closure decision is modeled as:

Post-regulatory status = Present value of future earnings
- (Present value of after-tax incremental pollution control costs * (1-percent cost pass-through[if passthrough is assumed]))
- Salvage value

That is, the model calculates long-term earnings after reduction by pollution control costs, and compares them to the liquidation value of the facility. If the post-regulatory status is less than zero, it does not make economic sense for the facility owner to upgrade the facility. Under these circumstances, the facility is projected to close. Section 3.3.1 describes alternative measures of future earnings, and the methods used to forecast the present value of future earnings. Section 3.3.2 describes how EPA adjusts the CPT from an industry-wide value to the facility-specific value in the closure model. Section 3.3.3 describes the options investigated for salvage value, and Section 3.3.4 presents EPA's methodology for determining facility closure when evaluating multiple approaches for estimating future earnings and salvage value.

3.3.1 Present Value of Future Earnings

EPA examined two alternatives for estimating the present value of future facility earnings:

- Net income from all operations, calculated as revenues less operating costs; selling, general, and administrative expenses; depreciation; interest; and taxes (as these items are recorded on the facility's income statement).
- Cash flow, which equals net income plus depreciation.

Depreciation reflects previous, rather than current, spending and does not actually absorb any portion of incoming revenues. Transportation equipment cleaning is an industry that does not show continuing capital investment for increased efficiency and expansion. For this reason, cash flow is more likely to indicate the funds available for operation than net income. EPA therefore selected cash flow as the basis for measuring the present value of future facility operations in the closure analysis (see Appendix C, proposal EA report, U.S. EPA, 1998, for details).

Forecasting Methods for Future Cash Flow

Facility cash flow must be forecast over the 16-year project lifetime. All forecasting methods examined for and used in the closure analysis incorporate the following assumptions and procedures:

- # No growth in real terms.
- # Constant 1994 dollars. (Data from 1992 and 1993 are inflated using the change in the Consumer Price Index.)

The "no growth" assumption is made so that a facility is not assumed to grow its way out of an economic impact associated with additional pollution control costs; essentially, EPA assumes that facilities are running at or near capacity and that significant growth is unlikely without a major capacity addition.

Although the financial health of the TEC industry is expected to follow that of the transportation sector in the general economy, an examination of the pretest survey data indicated that cash flow for a facility sometimes showed pronounced year-to-year variations. To address uncertainties in the long-term estimates of cash flow, EPA chose to incorporated more than one forecasting method when evaluating closure. EPA examined five different forecasting methods in order to address facility-specific variations; the following three methods were chosen:[4]

- # Most recent year (1994 data) as best indicator of future cash flow.
- # Three-year average (1992-to-1994 data, after inflation to 1994 dollars).
- # Time-varying cash flow option #1.
  Cash flow follows a 3-year pattern:
  1994 = 1994 cash flow
  1995 = 1993 cash flow
  1996 = 1992 cash flow
  1997 = 1993 cash flow

---

[4] EPA requested 3 years of data in the questionnaire to mitigate the uncertainty in the analysis resulting from a single datum point (i.e., 1 year of data).

1998 = 1994 cash flow (pattern begins again).

If the facility had a good/bad year in 1993, the result is a good/bad year every 2 years.

The model uses all three cash flow forecasts to evaluate the closure (see Section 3.3.4). The final step in estimating each facility's pre-regulatory present value is to discount the cash flow stream back to the first year in the time series. As in the cost annualization model, the facility-specific nominal discount rate must lie between 3 and 19 percent to be used in the model; otherwise the industry average nominal rate is used instead (Section 3.1).

3.3.2 Facility-Specific Cost Pass Through Factor

EPA models the closure decision alternatively assuming zero cost pass through and positive cost pass through. Where EPA uses a positive cost pass through assumption, the Agency uses the market model to estimate the percentage of incremental pollution control costs that are passed on to the consumer through higher prices. This price increase applies only to TEC services. However, most facilities earn revenues from non-TEC operations as well. For in-house facilities in particular, TEC services form only a small fraction of overall revenues. The price increase does not apply to these non-TEC operations. In order not to overestimate the increase in facility revenues due to higher prices for TEC services (and therefore underestimate the impacts of the rule), EPA adjusted the industry-wide cost pass through factor (CPT) by the facility-specific ratio of TEC revenues to total revenues. The result is a facility-specific cost pass through factor, also called the effective cost pass through.[5] Because commercial facilities as a group earn a higher percentage of revenues from TEC operations, the average effective CPT for commercial facilities is substantially higher than for in-house facilities.

[5] For example, suppose a facility earns total revenues of $1 million, of which 25 percent ($250 thousand) is attributable to tank cleaning revenues. A 20 percent increase in the price of tank cleanings (cost pass-through) will increase the facility's revenues by $50 thousand ($1 million x 0.2 x 0.25), not $200 thousand ($1 million x 0.2).

3.3.3 Salvage Value

Many service industries require little capital investment relative to manufacturing industries. The value of a service industry facility may be more closely related to its customer list, location (potential service area), and existing cash flow rather than to the value of its assets. Within a service industry, the year-long performance shown by a facility's income statement may be more important than the "snapshot in time" provided by the balance sheet. Under these circumstances, the salvage value based on assets is effectively zero. Because a manufacturing facility produces products, fixed assets—such as buildings and equipment—may play a more important role in estimating its liquidation or salvage value.

The TEC industry consists of facilities in both service and manufacturing industries. Even within a subcategory, there may be a mix of commercial providers of TEC services and in-house operations that are part of manufacturing facilities. EPA examined each subcategory and determined that a zero salvage value was appropriate for all but one subcategory (Denning, 1996). Under this approach, the closure decision described in Section 3.3 is based solely on whether the facility retains a positive long-term cash flow after responding to the regulation. The remaining subcategory is the RT/CHEM subcategory. EPA determined that it was appropriate to develop salvage value estimates for this subcategory based on the value of current and long-term assets (see Section C.2 of the proposal EA report, U.S. EPA, 1998, for details).

3.3.4 Projecting Facility Closures as a Result of the Rule

Tables 3-2A and 3-2B are annotated printouts of the closure model, which was completed using hypothetical data. With three different forecasts of each facility's cash flow, and two estimates each facility's salvage value, there are six ways to evaluate each facility's status. In order to use the same methodology and models for all subcategories, both the book and tax assessment estimates of salvage value are set to zero for all subcategories but RT/CHEM&PETR. If a facility's postregulatory cash flow status is less than zero (i.e., if its postregulatory cash flow is negative, or is less than salvage value for

TABLE 3-2A
FACILITY CLOSURE MODEL - HYPOTHETICAL INPUTS AND SALVAGE VALUES

A

CLOSURE MODEL Survey ID#: 1234 Class: run date:***************

ALL FIGURES IN DOLLARS

INPUT VARIABLES:

Inflation Rate (1995-2010):	3.6%
Co.-Specific Discount Rate (Nom.):	13.6%
Avg. Discount Rate (Nominal):	10.4%
Nominal Discount Rate:	13.6%
Real Discount Rate:	10.0%
Inventory Recovery Factor:	40.0%
Fixed Asset Recovery Factor:	20.0%

B SALVAGE VALUE:

CURRENT ASSETS:

1994 Cash:	$10,000
1994 Inventories:	$100
Total:	$10,040

FIXED ASSETS:

Tax Assessed Value:

	Assessed Value	Assessment Rate	Market Value	Recoverable Value
Total:	$500,000	100%	$500,000	$100,000

Book Value:

1994 Land:	$0
1994 Buildings:	$0
1994 Equipment:	$600,000
1994 Other Noncurrent Assets:	$1,000
Less Cum. Deprec.:	$140,000
Total:	$461,000
Recoverable Value:	$92,200

TOTAL SALVAGE VALUE OF MILL:

Using Tax Assessments:	$110,040
Using Book Value:	$102,240

TABLE 3-2B
FACILITY CLOSURE MODEL - HYPOTHETICAL INPUTS, FORECASTED CASH FLOW, AND CLOSURE SCORES

PRESENT VALUE:

C PAST CASH FLOW ($1994):

		Current $	$1994
Cash Flow	1992	12,500	$13,271
Cash Flow	1993	60,000	$61,794
Cash Flow	1994	15,000	$15,000

Inflate Cash Flow to 1994 dollars
Consumer Price Index for Transportation

1992	126.5
1993	130.4
1994	134.3

FORECASTED CASH FLOW

	Year	1994	Average	Variation
1	1995	$15,000	$30,022	$61,794
2	1996	$15,000	$30,022	$13,271
3	1997	$15,000	$30,022	$61,794
4	1998	$15,000	$30,022	$15,000
5	1999	$15,000	$30,022	$61,794
6	2000	$15,000	$30,022	$13,271
7	2001	$15,000	$30,022	$61,794
8	2002	$15,000	$30,022	$15,000
9	2003	$15,000	$30,022	$61,794
10	2004	$15,000	$30,022	$15,000
11	2005	$15,000	$30,022	$61,794
12	2006	$15,000	$30,022	$13,271
13	2007	$15,000	$30,022	$61,794
14	2008	$15,000	$30,022	$15,000
15	2009	$15,000	$30,022	$61,794
16	2010	$15,000	$30,022	$13,271
BASELINE PRESENT VALUE		ERR	ERR	ERR

D SUMMARY:

Cost Pass-Through	10%		Salvage Value						
			Assessment:	$0		Book:	ERR		
	PV of	Adj. PV of	Present Value			Present Value			
	Incremental	Incremental	1994	Average	Variation	1994	Average	Variation	
Regulatory Option	Reg. Costs	Reg. Costs	ERR	ERR	ERR	ERR	ERR	ERR	Closures
Baseline	$0		ERR	ERR	ERR	ERR	ERR	ERR	ERR
Option 1	$10,000	$9,000	ERR	ERR	ERR	ERR	ERR	ERR	ERR
Option 2	$20,000	$18,000	ERR	ERR	ERR	ERR	ERR	ERR	ERR
Option 3	$29,700	$26,730	ERR	ERR	ERR	ERR	ERR	ERR	ERR
Option 4	$75,000	$67,500	ERR	ERR	ERR	ERR	ERR	ERR	ERR
Option 5	$100,000	$90,000	ERR	ERR	ERR	ERR	ERR	ERR	ERR
Option 6	$125,000	$112,500	ERR	ERR	ERR	ERR	ERR	ERR	ERR
Option 7	$150,000	$135,000	ERR	ERR	ERR	ERR	ERR	ERR	ERR
Option 8	$175,000	$157,500	ERR	ERR	ERR	ERR	ERR	ERR	ERR
Option 9	$200,000	$180,000	ERR	ERR	ERR	ERR	ERR	ERR	ERR
Option 10	$300,000	$270,000	ERR	ERR	ERR	ERR	ERR	ERR	ERR
Option 11	$400,000	$360,000	ERR	ERR	ERR	ERR	ERR	ERR	ERR
Option 12	$500,000	$450,000	ERR	ERR	ERR	ERR	ERR	ERR	ERR

the RT/CHEM&PETR subcategory), the facility is assigned a score of "1" for that forecasting method/salvage value estimate comparison. A facility, then, may have a score ranging from 0 to 6.[6]

Closure is the most severe impact that can occur at the facility level and represents a final, irreversible decision in the analysis. The decision to close a facility is not made lightly; business owners are aware of and concerned with community impacts, the turmoil introduced into worker's lives, and how the action might be interpreted by stockholders. The business will likely investigate several business forecasts and several methods of valuing their assets. All data, assumptions, and projections of future market behavior would be weighed in the corporate decision to close a mill, and the uncertainties associated with the projections would be evaluated. When examining the results of several analyses, business owners are likely to find that the results are mixed. Some indicators may be negative, while others show that the facility can weather the current difficult situation. A decision to close a facility is likely to be made only when the weight of evidence indicates that this is the appropriate path for the company to take.

EPA simulated corporate decision making patterns when determining when a facility would close. A score of 3 means that half of the comparisons indicate a financially viable concern. A business is unlikely to close a facility when the uncertainty in the data means there is a 50-50 chance of it being viable. EPA selected a score of 4 or higher to indicate closure because it meant that the majority of the comparisons (i.e., at least 4 of 6) now indicate poor financial health. EPA believes that this scoring approach represents a reasonable and conservative method for determining closure.

Closure impacts are assessed on an incremental basis. A facility closure is considered to be closed by regulatory cost when its pre-regulatory closure score is 3 or less, and its post-regulatory score is greater than 3. For example, in Table 3-2B, Section D, the facility begins to show the effects of incremental compliance costs with option 3, but is not considered a closure until option 8.

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[6] Because both book and tax assessment valuations of all non-RT/CHEM&PETR facilities are equal to zero, facilities in these subcategories will have scores of 0, 2, 4, or 6.

3.4 FINANCIAL RATIO ANALYSIS

EPA's financial ratio analysis examines whether a company could afford the cost of upgrading all the TEC facilities that it owns. Particularly for companies that own more than one TEC facility, it could make economic sense to upgrade each facility, but the company may not be able to afford the total cost of upgrading all the facilities that it owns. Many banks use financial ratio analyses to asses the credit worthiness of a potential borrower. If the incidence of regulatory costs causes a company's financial ratios to move into an unfavorable range, the company will find it more difficult to borrow money. Under these conditions, EPA considers the company and each facility that it owns to be experiencing "financial distress short of closure."

Financial ratios are calculated at the business entity level because:

- Complete financial statements (balance sheet and income statement) are maintained at the business entity or corporate level, but not necessarily at the facility level. The survey data indicate that many companies do not keep complete financial statements at the facility level.
- Significant financial decisions, such as expansion of a facility's capacity, are typically made or approved at the corporate level.
- The business entity (or corporate parent, where one exists) is the legal entity responsible for repayment of a loan. The lending institution evaluates the credit-worthiness of the business entity, not the facility.

Section 3 of the detailed questionnaire collected business entity financial information (U.S. EPA, 1995a). The questionnaire was sent to a sample, not a census, of TEC facilities. EPA calculates national estimates with statistical weights for each facility in the sample. Because the sampling frame was developed on the basis of facility attributes, it is not possible to develop statistical weights for business entity results, and the number of financially distressed business entities cannot be estimated (Denning, 1997). Instead, the impacts are passed to the facility level through the facility-level weights. For example, suppose a company owns one TEC facility, that facility has a weight of seven, and regulatory costs place the company in financial distress. This report would describe the impacts as seven facilities are owned by corporate parents that show financial distress, not seven businesses show financial distress.[7]

Section 3.4.1 discusses the aggregation of facility-level regulatory cost data required to perform the ratio analysis at the business entity level. Section 3.4.2 presents the Altman Z0-score, a weighted average of financial ratios used to assess financial distress.

3.4.1 Aggregation of Facility-Level Regulatory Cost Data

EPA estimated costs on a facility basis. EPA aggregated facility-level regulatory costs to the business entity level in order to assess the impact of the total costs incurred by the entity. As mentioned above, the TEC data represent a sample and not a census. Some business entities in the survey own TEC facilities that were not sampled. In order to avoid underestimating the impact on these firms' financial ratios, compliance costs must be estimated for those TEC facilities not in the sample. Each of the 66 (unweighted) discharging facilities in the regulated subcategories that received detailed questionnaires fall into one of three groups:

- 28 facilities (171 weighted facilities) represent the only TEC facility owned by the company ("SF," or single facility, firms). Of these 19 facilities, (122 weighted facilities) are stand-alone business entities.
- 9 facilities (61 weighted facilities) are owned by parent companies that own other TEC facilities; the facility in question, however, is the only facility owned by the parent company that received a questionnaire ("SQ," or single questionnaire, firms).
- 29 facilities (147 weighted facilities) are owned by parent companies that own other TEC facilities; each parent company owns more than one facility that received a questionnaire. The parent company, however, typically owns other TEC facilities that did not receive questionnaires ("MQ," or multiple questionnaire, firms).

For the SF group of facilities, the facility compliance costs are equal to the business entity compliance costs.

[7] For 122 of the 378 discharging facilities (32.3 percent), the facility and the business entity are identical; these are called stand-alone facilities. A stand-alone facility with a weight of seven would represent seven business entities.

For the SQ and MQ groups, EPA scaled the costs for the TEC facilities in the survey to estimate the costs for all TEC facilities owned by the business entity. The factor used to scale up facility compliance costs is calculated from the ratio of facility TEC operating costs to business entity TEC operating costs. The inverse of this ratio is used as the scaling factor; individual facility costs are multiplied by the scaling factor then summed over all facilities in the questionnaire database owned by the parent business entity. TEC costs were chosen to calculate the scaling factor. This ratio captures the size of facility TEC operations relative to parent business entity TEC operations better than other alternative measures such as: (1) the ratio of facility TEC revenues to total business TEC revenues, (2) subcategory median cost, or (3) subcategory average cost.[8]

3.4.2 Altman ZO-Score

EPA selected a weighted average of financial ratios, called the Altman ZO-score, to characterize the baseline and post-regulation financial conditions of potentially affected firms. The Altman ZO-score is a multidiscriminant function, originally developed to assess bankruptcy potential (Altman, 1993).[9] The ZO-score has advantages over consideration of an individual ratio or a collection of individual financial ratios:

It is a simultaneous consideration of liquidity, leverage, profitability, and asset management. It addresses the problem of how to interpret data sets in which some financial ratios look "healthy" while other ratios look "unhealthy."

[8] Some business entities in the database own both in-house and commercial facilities; facilities also may differ greatly in size. Suppose, for example, that one firm owns two TEC facilities, only one of which is in the database. One facility accounts for 90 percent of TEC operations and performs commercial cleanings, while the second accounts for 10 percent of TEC operations and performs only in-house cleanings. The selected approach provides a more accurate estimate of the costs borne by the business entity than would the revenue ratio scale or median/average subcategory compliance costs approach.

[9] EPA uses the Altman ZO-score as an indication of financial distress, but not necessarily bankruptcy. A ZO-score below "bankruptcy likely" is a warning sign, not a determination of immediate bankruptcy. There is a time lag between a warning (i.e., low ZO-score) and actual bankruptcy. During this period, a company has the opportunity to change its behavior to avoid the projected bankruptcy. The Chrysler Corporation is such an example; Altman (1993) cites other examples. If a business entity's ZO-score falls below the "bankruptcy likely" cutoff as a result of the rule, EPA considers the option to have caused financial distress. The company will likely have to change the way it does business to respond to the regulation.

- # There are defined threshold or cut-off values for classifying firms in good, indeterminant, and poor financial health. "Rules of thumb" are available for some financial ratios, such as current ratio and times interest earned, but these frequently vary with the industry (U.S. EPA, 1995b).

- # The Altman Z0-score is a well accepted standard technique of financial analysis (see Brealy and Meyers, 1996, and Brigham and Gapenski, 1997).

Altman developed several variations on the multidiscriminant function. EPA selected the Z0-score because it was developed to evaluate public and private nonmanufacturing firms. Altman (1993) 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." Based on this criteria, the Z0-score model is the most appropriate model for the TEC industry.

The model is:

$$Z0 = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

where the pre-compliance components are:

Z0 = overall index

X_1 = working capital/total assets

X_2 = retained earnings/total assets

X_3 = earnings before interest and taxes (EBIT)/total assets

X_4 = book value of equity/book value of total liabilities.

Taken individually, each of the ratios given above 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 Z0-score below 1.1 indicates that bankruptcy is likely; a score above 2.6 indicates that bankruptcy is unlikely. Z0-scores between 1.1 and 2.6 are indeterminant. Preregulatory scores are calculated from survey data.

EPA estimates financial distress short of closure based on changes that occur in the Altman Z0-score as a result of pollution control costs. Compliance costs affect the financial ratios through their impact on assets and earnings, decreasing the value of each ratio:

X_1 = working capital/(total assets + capital costs)

X_2 = retained earnings/(total assets + capital costs)

X_3 = (EBIT - pre-tax annualized compliance costs)/(total assets + capital costs)

X_4 = book value of equity/(book value of total liabilities + capital costs)

Capital costs are those developed by the engineering staff for use in the cost annualization model, and the annualized pollution control costs for each option were calculated from both capital and operating and maintenance costs using the cost annualization model. The Altman Z0 approach assumes that the firm would incur debt in some form for the capital cost. An alternative is to assume that the equipment could be purchased out of working capital; however, the first approach is more likely.

3.4.3 Evaluation of Altman Z" Results

Postregulatory financial stress is evaluated and reported on an incremental basis. Facilities are described as incurring financial stress short of closure when their parent firm has a pre-regulatory Altman Z0-score that is greater than 1.1 (the upper bound of the bankruptcy likely range), and a post-regulatory score that is less than 1.1. The financial distress is considered "short of closure" because facilities estimated to be incremental closures in the closure model are removed from the analysis. A facility cannot be both an incremental closure and incur incremental financial distress. The results of the closure model take precedence because a company is more likely to close a facility than jeopardize the financial health of the entire business with the facility's upgrade. Facilities that are expected to remain open are then examined for financial distress using financial ratio analysis.

3.5 SECONDARY IMPACTS

The impacts to output and employment in non-TEC industries caused by the regulation of the TEC industry are called secondary impacts. The secondary impact analysis assesses national and regional output and employment impacts resulting from compliance with the proposed effluent limitations guidelines for the TEC industry. Compliance costs decrease the output of the TEC industry, which may cause a loss in TEC employment.[10] The decrease in TEC output decreases the demand for products in the industries that supply inputs to the TEC industry. As a result, these industries may suffer reduced output and employment as well. However, iIn other industries the need to manufacture, install, operate, and maintain the pollution control equipment required under the new regulation may generate increased economic activity. This increase in economic activity resulting from compliance with the regulation can result in output and employment gains that offset the losses caused by the regulation.

The analysis in this section identifies a range of estimated secondary impacts caused by the TEC regulation. Section 3.5.1 describes the input-output (IO) methodology used to estimate secondary impacts and the application of this methodology to the TEC industry. Section 3.5.2 presents the procedure used to estimate offsetting gains from purchasing wastewater treatment systems. Section 3.5.3 describes the difficulties associated with estimating regional impacts for the proposed TEC options.

3.5.1 Methodology for Estimating National Employment and Output Impacts

EPA generates national output and employment impact estimates through the use of output and employment multipliers derived from the National Input-Output (IO) tables compiled by the Bureau of Economic Analysis (U.S. Department of Commerce, 1997). IO multipliers estimate the total impact on the national economy that will result from change in the quantity purchased of a single industry's output. Impacts include the change in the quantity purchased of the industry's output (direct effects), the impact on the industry's suppliers (indirect effects), and the impacts caused by the change in expenditures by employees of all impacted industries due to their changed income (induced effects). Multipliers vary between industries because of differences in their upstream effects (the degree to which an industry uses other industries' production as inputs) and downstream effects (the degree to which an industry supplies inputs into other industries).

A change in the number of tank cleanings by the TEC industry may have a number of effects. For example, a decrease in tank cleanings by the TEC industry caused by the regulation will decrease the

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[10] This loss in employment may be comprised of actual job losses, or may be reflected in a decrease in the number of hours worked by several employees, all of whom retain their jobs. For this reason, employment impacts are measured as "full-time-equivalents" (FTEs), where one FTE equals 2,080 labor hours or 1 person-year of employment.

demand for tank cleaning solvents. This may cause the suppliers of tank cleaning solvents to decrease their production of solvents, impacting those industries that supply them with the inputs required to manufacture the solvents. In addition, the employees of each industry will experience a decrease in income; this will affect their purchases of other products. The final demand multiplier estimates the total dollar value of output lost due to the decreased demand for other products caused by the decreased supply of tank cleaning services.

3.5.1.1 Input-Output Multiplier Methodology

To use the final demand output multiplier, the loss in industry output caused by the decrease in supply must be estimated. This lost output is expressed in terms of decreased industry revenues (i.e., the dollar value of lost output). Figure 3-5 illustrates the change in industry revenues caused by the regulation. The rectangle bounded by P^*Q^* represents total pre-compliance industry revenues, while the rectangle bounded by P^2Q^1 represents post-compliance industry revenues attributable to tank cleaning services; the difference between the two rectangles represents the value of output lost due to the regulation. Next, estimated output loss in the regulated industry is multiplied by the final demand output multiplier for the industry to calculate the decrease in total national output caused by the regulation:

output loss x final demand output multiplier = total national output loss

The total loss in national output includes the lost output in the regulated industry as well as indirect and induced losses in industries that provide inputs to the industry, and final consumption goods.

However, this calculation does not account for all regulatory impacts. Compliance costs are passed through to customer industries in the form of increased prices; this price change increases the customer industries' costs of operation (a decrease in supply), which in turn reduces the quantity of output they provide and generates secondary impacts for their suppliers as well. In Figure 3-5 the cost passed through is represented by the increase in equilibrium price from P^* to P^1 multiplied by the number of tanks cleaned at that price, Q^1. Secondary impacts may also be generated by compliance costs that are avoided by the regulated industry by passing them through to their customers. Multiplying the value of output represented by $(P^1 - P^*) \times Q^1$ by the final demand multiplier for the customer industries accounts for these impacts.

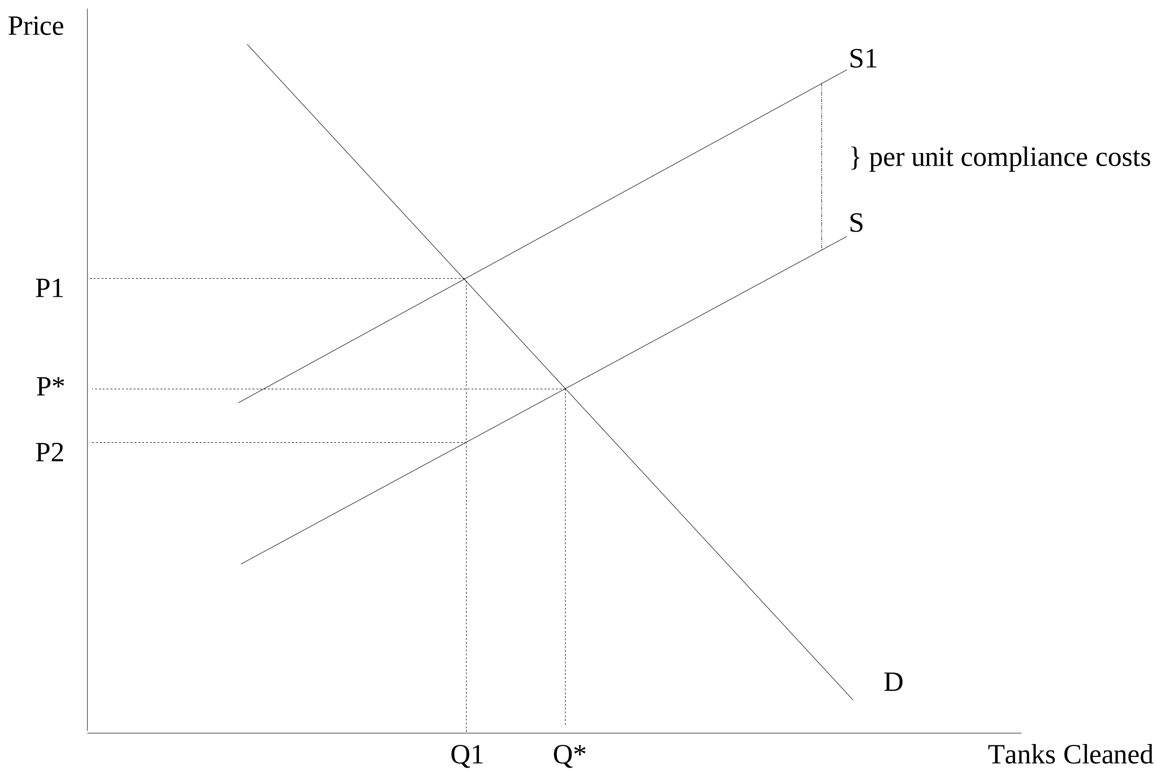

Figure 3-5

Lost Output and Transfer Payments
for Calculation of Secondary Impacts

In addition to the final demand output multiplier, EPA will use the final demand employment multiplier and the direct effect employment multiplier to estimate national employment impacts. The final demand employment multiplier uses data on the labor input required per dollar of output in each industry to estimate the direct, indirect, and induced changes in national employment (measured in FTEs) caused by the initial change in the regulated industry's output:

output loss x final demand employment multiplier = total national employment loss

This final demand employment multiplier essentially estimates the total number of employees in all industries required to produce $1 million of the regulated industry's output.

EPA also makes use of the direct effect employment multiplier in estimating impacts. Typically, unemployment in a regulated industry is estimated directly from incremental facility closures. There are no incremental facility closures projected under the selected regulatory options for the TEC industry, however, though the postcompliance decrease in tank cleanings projected by the TEC market model does imply employment impacts. The direct effect employment multiplier can be used to estimate the unemployment impacts in the regulated industry.

The key to estimating employment impacts in the regulated industry from the direct effect employment multiplier is the relationship between that multiplier and the final demand employment multiplier. The final demand employment multiplier described above estimates total national employment impacts based on the change in *output* in the regulated industry. The direct effect employment multiplier also estimates total national employment impacts, but this estimate is based on the change in *employment* in the regulated industry:

industry employment loss x direct effect employment multiplier = national employment loss

Because both multipliers are derived from the same underlying relationships in the production process, the national impacts estimated from changes in employment should be consistent with national impacts estimated from changes in output. EPA can directly estimate output losses in the regulated industry and use the final demand employment multiplier to estimate national employment impacts. National employment impacts can then be divided by the direct effect employment multiplier to estimate the loss in industry employment:

national employment loss ÷ direct effect employment multiplier = industry employment loss

This estimate is valid because all three multipliers are derived from the same underlying relationships estimated in the IO tables. All IO multipliers used in the secondary impacts analysis are listed in Appendix E of the proposal EA report (U.S. EPA, 1998).

3.5.1.2 Application of Input-Output Methodology to the TEC Industry

Although the application of IO multipliers to estimate impacts is straightforward in theory, practical application to the TEC industry is difficult for two reasons. First, the Bureau of Economic Analysis does not provide IO multipliers for the TEC industry. Second, lost industry output is difficult to estimate because a significant proportion of tank cleanings occur with no market transaction (i.e., in-house cleanings).

To address the first problem, EPA applied the IO multipliers for transportation services according to the transportation mode of the subcategory (e.g., facilities in the TB/CHEM&PETR subcategory were assigned the IO multiplier for water transportation services, IO category 65.04). EPA chose this strategy because each of the activities performed by facilities that provide TEC services (such as building or repairing tank containers, terminal operations by shippers and carriers, or TEC services alone) are inputs into the transportation service industry. Any regulatory impact to the TEC industry affects the national economy through its impact on transportation services.

To address the second problem, EPA chose to value in-house cleanings at the preregulatory market equilibrium price for commercial cleanings. Under perfect competition, the price of a good or service is just equal to the marginal cost of supplying it. EPA thus assumed that the value of tank cleaning to society is reflected in the price of providing that service.

3.5.2 Estimation of Output and Employment Gains

Negative impacts to output and employment caused by the regulation may be offset by positive impacts to industries and individuals that provide wastewater treatment services. In Figure 3-5, the cost of wastewater treatment per tank cleaned is equal to the difference between P^1 and P^2.[11] While compliance costs represent a loss in revenues to providers and customers of TEC services, they also represent income to the providers of wastewater treatment services. Compliance costs, from society's viewpoint, are not a net loss, but a transfer of income from one industry to others. Thus, compliance costs represent an increase in the demand for wastewater treatment systems, the construction services to install the systems, chemicals and parts to operate and maintain the systems, and labor services to run the systems. The increase in demand for each of these components causes increased demand in those industries which supply them. Therefore compliance costs cause positive secondary impacts that are also estimated through IO output and employment multipliers.

Application of IO multiplier methodology to estimate output and employment gains due to regulation of the TEC industry is much more straightforward than the application to estimate losses. Total annualized compliance costs represent the gain in output to suppliers of wastewater treatment systems. The final demand output and employment multipliers are applied to total annualized compliance costs to calculate positive secondary impacts. The primary modification required is that different components of compliance costs represent an increase in demand to different industries that have different multipliers. Thus, annualized compliance costs must be disaggregated before IO multipliers can be applied.

Total secondary output gains from the regulation are measured as the sum of the following compliance costs, multiplied by the appropriate industry final demand output multipliers to determine total direct, indirect, and induced gains attributable to the regulation:

- Annualized capital costs, disaggregated into capital and installation components.
- Annual operating and maintenance costs attributable to monitoring, waste disposal, materials, and energy use.

Annual expenditure on operating and maintenance labor services are then added to the estimated increase in total national output (i.e., the multiplier is set equal to one).

[11] Total compliance costs are equal to $(P^1 - P^2) \times Q^1$.

Total secondary employment gains from the regulation are measured as the sum of the following compliance costs, multiplied by the appropriate industry final employment multipliers to determine total direct, indirect, and induced gains attributable to the regulation:

- Annualized capital costs, disaggregated into capital and installation components.
- Annual operating and maintenance costs attributable to monitoring, waste disposal, materials, and energy use.

Annual expenditure on operating and maintenance labor services converted to FTE employment are then added (i.e., the multiplier is set equal to one) to the total. All multipliers used to estimate secondary impact gains are listed in Appendix E of the proposal EA report (U.S. EPA, 1998).

3.5.3 Regional Impacts

Because the TEC industry detailed questionnaire was sent to a sample of TEC facilities stratified by type of tank cleaned and certain financial characteristics, EPA cannot determine the geographical distribution of TEC facilities with any degree of statistical confidence. In addition, the closure model projects no facility closures under the preferred options,[12] and market model projections of impacts provide no means of ascertaining how these aggregate impacts are distributed across facilities. For these reasons, it is impossible for EPA to accurately project impacts to any particular geographical region.

3.6 REFERENCES

Altman. 1993. Altman, Edward. Corporate financial distress and bankruptcy. New York: John Wiley and Sons.

Brealy and Meyers. 1996. Brealy, Richard A., and Stewart C. Myers. Principles of corporate finance (5th ed.). New York: The McGraw-Hill Companies, Inc.

Brigham and Gapenski. 1997. Brigham, Eugene F., and Louis C. Gapenski. Financial management: Theory and practice (8th ed.). Fort Worth: The Dryden Press.

[12] In previous EAs, projected facility closures have been used to estimate regional and community impacts.

CEA. 1995. Economic report of the president. Washington, DC; Council of Economic Advisors. Table B-59.

Denning. 1996. Cash flow vs. salvage value. Phone call from George Denning, EPA, WAM, to Calvin Franz, ERG. Memo to TEC Industry Project File. October 18.

Denning. 1997. Business entity weights. Phone call from George Denning, EPA, WAM, to Calvin Franz, ERG. Memo to TEC Industry Project File. April 22.

IRS. 1995. The complete internal revenue code. New York: The Research Institute of America, Inc. January.

U.S. Department of Commerce. 1997. Regional multipliers: A user handbook for the regional input-output modeling system (RIMS II). Washington, DC: U.S. Department of Commerce. March.

U.S. EPA. 1995a. 1994 Detailed questionnaire for the transportation equipment cleaning industry. OMB No. 2040-0179. Washington, DC: U.S. Environmental Protection Agency, Office of Water. April.

U.S. EPA. 1995b. Interim economic guidance for water quality standards: Workbook. EPA-823-B-95-002. Washington, DC: U.S. Environmental Protection Agency, Office of Water.

U.S. EPA. 1998. Economic Analysis of Proposed Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA 821/B-98-012. Washington, DC: U.S. Environmental Protection Agency, Office of Water. May.

U.S. EPA. 2000. Cost-Effectiveness Analysis of Final Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA-821-R-00-014. Washington, DC: U.S. Environmental Protection Agency, Office of Water. June.

CHAPTER 4

POLLUTION CONTROL OPTIONS

4.1 EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS

The Federal Water Pollution Control Act (commonly known as the Clean Water Act [CWA, 33 U.S.C. §1251 et seq.]) establishes a comprehensive program to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (§101(a)). EPA is authorized under sections 301, 304, 306, and 307 of the CWA to establish effluent limitations guidelines and pretreatment standards of performance for industrial dischargers. The standards EPA establishes include:

- Best Practicable Control Technology Currently Available (BPT) . Required under section 304(b)(1), these rules apply to existing industrial direct dischargers. BPT limitations are generally based on the average of the best existing performances by plants of various sizes, ages, and unit processes within a point source category or subcategory.

- Best Available Technology Economically Achievable (BAT). Required under section 304(b)(2), these rules control the discharge of toxic and nonconventional pollutants and apply to existing industrial direct dischargers.

- Best Conventional Pollutant Control Technology (BCT). Required under section 304(b)(4), these rules control the discharge of conventional pollutants from existing industrial direct dischargers.[1] BCT limitations must be established in light of a two-part cost-reasonableness test. BCT replaces BAT for control of conventional pollutants.

- Pretreatment Standards for Existing Sources (PSES). Required under section 307. Analogous to BAT controls, these rules apply to existing indirect dischargers (whose discharges flow to POTWs.

- New Source Performance Standards (NSPS). Required under section 306(b), these rules control the discharge of toxic and nonconventional pollutants and apply to new source industrial direct dischargers.

- Pretreatment Standards for New Sources (PSNS). Required under section 307. Analogous to NSPS controls, these rules apply to new source indirect dischargers (whose discharges flow to POTWs).

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[1] Conventional pollutants include biochemical oxygen demand (BOD), total suspended solids (TSS), fecal coliform, pH, and oil and grease.

EPA is promulgating effluent limitations guidelines and pretreatment standards for certain subcategories in the TEC industry in this rulemaking effort.

4.2 TECHNOLOGY OPTIONS

4.2.1 General Information

EPA does not mandate technologies when establishing effluent limitations guidelines and pretreatment standards. However, EPA evaluates various technology options in order to base the limitations on demonstrated technologies and to evaluate the economic impact of the cost of those technologies on the regulated industry. This section briefly describes the pollution control options evaluated for each regulated subcategory within the TEC industry. The Development Document (U.S. EPA, 2000) provides a detailed description of the TEC industry subcategories and pollution control options for each subcategory.

In addition to wastewater treatment technologies, each option specifies the use of good heel removal and management practices, and good water conservation practices. Heel control, the removal of material from the bottom of the tank (i.e., "heel") before cleaning, reduces the amount of pollutants that must be captured by the wastewater treatment system. Good water conservation practice minimizes the use of water to clean the tanks. The treatment train can then be sized for a smaller volume of wastewater, resulting in savings on both capital equipment costs and operation and maintenance costs for a given facility. Also, because the pollutant concentrations in the wastewater are higher (i.e., same pollutant mass in a smaller volume of water), the pollution control equipment can work more efficiently (U.S. EPA, 2000).

4.2.2 Option Description

Table 4-1 summarizes the technology options considered for each TEC industry subcategory. The first column indicates the option number that appears in the cost and impact tables in Chapters Five through Nine. The second column identifies the technology option proposed for each standard. The third column contains a brief description of the technology option. For the three major subcategories—TT/CHEM&PETR, RT/CHEM&PETR, and TB/CHEM&PETR—EPA developed different sets of options for indirect and direct dischargers. For example, Option 2 for the TT/CHEM&PETR subcategory considers biological treatment for direct dischargers but not for indirect dischargers. Therefore, each of these subcategories is actually two different subcategories (e.g., TT/CHEM&PETR is split into two subcategories: TT/CHEM&PETR Direct and TT/CHEM&PETR Indirect).

As discussed in Section 2.3, EPA is not regulating the HOPPER subcategory (all modes of transportation) or the FOOD Indirect subcategory. Thus all mention of the FOOD subcategory in the remainder of this report refers only to the FOOD Direct Subcategory. As a result, there are seven regulated subcategories, as shown in Table 4-1.

EPA developed between one and three technology options for each subcategory based on incremental technology additions to a wastewater treatment train. Option 1 presents the basic treatment train for the subcategory. Option 2 then adds further treatment technologies to the treatment train specified in Option 1. The incremental or distinguishing technology for each option is described in italics in Table 4-1. For example, Option 2 for direct dischargers in the TT/CHEM&PETR Direct subcategory includes all Option 1 technologies plus an activated carbon adsorption unit; the activated carbon adsorption unit is referred to as the incremental technology. Similarly, for subcategories that specify a third option, Option 3 includes all Option 2 technologies plus an incremental technology.

For TT/CHEM&PETR Direct, EPA has selected Option 2 for BPT, BCT, BAT, and NSPS. EPA has selected Option 1 for BPT, BCT, BAT, and NSPS in the RT/CHEM&PETR Direct subcategory. For the TB/CHEM&PETR Direct subcategory, EPA has selected Option 1 for BPT, BCT, BAT, and NSPS. EPA has selected Option 2 for BPT, BCT, and NSPS in the regulated FOOD subcategory (which comprises only direct dischargers); BAT is not being promulgated for the FOOD subcategory because few priority and nonconventional pollutants are either discharged or removed.

TABLE 4-1

TECHNOLOGY OPTIONS FOR TEC INDUSTRY SUBCATEGORIES

Option	Selected Option for Final Rule	Description
		TT/CHEM&PETR Direct
1[1]		Equalization, oil/water separation, chemical oxidation, neutralization, coagulation, clarification, biological treatment, and sludge dewatering
2	BPT, BCT, BAT, NSPS	Equalization, oil/water separation, chemical oxidation, neutralization, coagulation, clarification, biological treatment, *activated carbon adsorption*, and sludge dewatering
		TT/CHEM&PETR Indirect
A		Equalization, and oil/water separation
1	PSES, PSNS	Equalization, oil/water separation, *chemical oxidation*, *neutralization*, *coagulation*, *clarification*, and *sludge dewatering*
2		Equalization, oil/water separation, chemical oxidation, neutralization, coagulation, clarification, *activated carbon adsorption*, and sludge dewatering
		RT/CHEM&PETR Direct
1		Oil/water separation, equalization, biological treatment, and sludge dewatering
2	BPT, BCT, BAT, NSPS	Oil/water separation, equalization, *dissolved air flotation (with flocculation and pH adjustment)*, biological treatment, and sludge dewatering
3		Oil/water separation, equalization, dissolved air flotation (with flocculation and pH adjustment), biological treatment, *organo-clay/activated carbon adsorption*, and sludge dewatering
		RT/CHEM&PETR Indirect
1		Oil/water separation
2	PSES, PSNS	Oil/water separation, *equalization*, *dissolved air flotation (with flocculation and pH adjustment)*, and *sludge dewatering*
3		Oil/water separation, equalization, dissolved air flotation (with flocculation and pH adjustment), *organo-clay/activated carbon adsorption*, and sludge dewatering

TABLE 4-1 (continued)

Option	Selected Option for Final Rule	Description
TB/CHEM&PETR Direct		
1	BPT, BCT, BAT, NSPS	Oil/water separation, dissolved air flotation, filter press, biological treatment, and sludge dewatering
2		Oil/water separation, dissolved air flotation, filter press, biological treatment, *reverse osmosis*, and sludge dewatering
TB/CHEM&PETR Indirect		
1		Oil/water separation, dissolved air flotation, and in-line filter press
2	PSES, PSNS	Oil/water separation, dissolved air flotation, in-line filter press, *biological treatment (with chemically assisted clarification)*, and *sludge dewatering*
3		Oil/water separation, dissolved air flotation, in-line filter press, biological treatment (with chemically assisted clarification), *reverse osmosis*, and sludge dewatering
FOOD		
1		Oil/water separation
2	BPT, BCT NSPS	Oil/water separation, *equalization*, *biological treatment*, and *sludge dewatering*

Note: EPA developed options based on incremental technology additions to a treatment train. Each option builds upor previous option. Technologies incremental to the previous option are shown in italics to help the reader identify distinguishing characteristics of an option.

[1] Option 1 has identical costs and removals as Option 2.

For TT/CHEM&PETR Indirect, EPA has selected Option 1 for PSES and PSNS. EPA has selected Option 2 for PSES and PSNS for RT/CHEM&PETR Indirect. For the TB/CHEM&PETR Indirect subcategory, EPA has selected Option 2 for PSES and PSNS.

4.2.3 Pollution Prevention Plan Option

EPA is also promulgating a pollution prevention (P2) option as an alternative to the PSES and PSNS performance standards for the TT/CHEM&PETR and RT/CHEM&PETR subcategories. Facilities selecting this alternative shall prepare a Pollutant Management Plan and conduct their operations in accordance with that plan. The Pollutant Management Plan will contain the following components:

- procedures for identifying cargos that are likely to result in discharges of pollutants incompatible with treatment at the POTW

- for cargos identified as incompatible with treatment at the POTW:
  - heels will be fully drained and segregated from other wastewaters
  - tanks will be prerinsed or presteamed as appropriate, and the wastewater will be segregated from wastewaters to be discharged to the POTW,
  - all spent cleaning solutions, including interior caustic washes, interior pre-solve washes, interior detergent washes, interior acid washes, and exterior acid brightener washes will be segregated from other wastewaters.

The Pollutant Management Plan will contain provisions for the:

- appropriate recycling or reuse of cleaning agents;

- appropriate recycling or reuse of segregated wastewaters (including heels and pre-rinse/pre-steam wastes);

- off-site treatment or disposal, or effective pre-treatment of segregated wastewaters (including heels, pre-rinse/pre-steam wastes, spent cleaning solutions);

- minimizing the use of toxic cleaning agents (solvents, detergents, or other cleaning or brightening solutions).

As part of its Pollutant Management Plan, the facility will also be required to maintain:

- information on the volumes, content, and chemical characteristics of cleaning agents used in cleaning or brightening operations; and

- # appropriate records of heel management procedures, pre-rinse/pre-steam management procedures, cleaning agent management procedures, operator training, and proper operation and maintenance of any pre-treatment system.

4.3 MONITORING OPTIONS

EPA evaluated each technology option in conjunction with assumed monitoring costs. EPA assumes TT/CHEM&PETR facilities monitor monthly for metals, RT/CHEM&PETR facilities monitor monthly for semivolatiles, and TB/CHEM&PETR facilities monitor monthly for both semivolatiles and metals. In addition, all direct dischargers are assumed to monitor weekly for conventional pollutants, and all indirect dischargers are assumed to monitor monthly for total petroleum hydrocarbons. EPA examines monitoring costs as well as technology costs in the economic analysis. The Final Rule does not mandate a specific monitoring frequency. In practice, monitoring frequency is determined by the permit writers. Most facilities, particularly indirect dischargers, monitor for toxic pollutants less frequently than once a month (Bradley, 1998). Therefore, monthly monitoring is a conservative assumption for analyzing economic impacts.

Table 4-2 presents average annual monitoring costs per facility for direct and indirect dischargers. Monitoring costs are included in the compliance costs presented in Table 5-1.

4.4 REFERENCES

Bradley. 1998. Memorandum from Patrick Bradley, EPA Permits Division, to Neil Patel, U.S. Environmental Protection Agency, Office of Water, Economics and Statistics Division. March.

U.S. EPA. 2000. Development Document for the Final Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA-821-R-00-012. Washington, DC: U.S. Environmental Protection Agency, Office of Water. June.

TABLE 4-2

AVERAGE FACILITY MONITORING COSTS ($1994)

Subcategory	Type of Pollutants Monitored	Frequency	Annual Cost Per Facility
Direct Dischargers			
TT/CHEM&PETR	Metals Conventionals	Monthly Weekly	$9,936
RT/CHEM&PETR	Semivolatiles Conventionals	Monthly Weekly	$6,960
TB/CHEM&PETR	Semivolatiles and Metals Conventionals	Monthly Weekly	$14,136
Indirect Dischargers			
TT/CHEM&PETR	Metals and Total Petroleum Hydrocarbons	Monthly	$7,856
RT/CHEM&PETR	Semivolatiles and Total Petroleum Hydrocarbons	Monthly	$4,880
TB/CHEM&PETR	Semivolatiles, Metals and Total Petroleum Hydrocarbons	Monthly	$12,056

CHAPTER 5

ECONOMIC IMPACTS

5.1 OVERVIEW

This chapter presents the projected economic impacts of the identified technology alternatives on the TEC industry. These impacts result from the costs associated with the incremental pollution control requirements discussed in Chapter 4. Although a facility need not install any specific pollution control technology, the regulatory requirements are based on a technology that can achieve the specified effluent limitations and standards. In this chapter, EPA evaluates the impacts of these costs using the models discussed in Chapter 3.

EPA is promulgating BPT, BAT, BCT, and NSPS standards in the TT/CHEM&PETR, RT/CHEM&PETR, and TB/CHEM&PETR subcategories. EPA is also promulgating PSES and PSNS in the TT/CHEM&PETR, RT/CHEM&PETR, and TB/CHEM&PETR subcategories. EPA is promulgating BPT, BCT, and NSPS (but not BAT) standards in the FOOD subcategory.

Individual impact results are not reported in this section for the TT/CHEM&PETR Direct, RT/CHEM&PETR Direct, and TB/CHEM&PETR Indirect subcategories because of confidential business information (CBI) disclosure issues. For these subcategories, EPA reports the individual impacts in *Summary of Economic Impacts to TT/CHEM&PETR Directs, RT/CHEM&PETR Directs, and TB/CHEM&PETR Indirects* (U.S. EPA, 2000b), which is a CBI document located in the rulemaking record.

For indirect dischargers in the TB/CHEM&PETR subcategory, all facilities have sufficient treatment in place. Therefore these facilities only incur monitoring costs. As discussed in Chapter 4, the Final Rule does not mandate monitoring frequency. Instead, monitoring requirements are determined by the permit writers. In practice indirect dischargers monitor less frequently than once per month, therefore monthly monitoring is a conservative assumption for analyzing economic impacts.

Results are also not reported for the FOOD subcategory. For the proposed option, EPA determined all direct discharging FOOD facilities have Option 2 treatment in place and EPA has estimated that there are no costs or impacts associated with any option for this subcategory (U.S. EPA, 1998). EPA received no comments on the proposed option and did not revise its analysis for this subcategory.

For the purposes of this report, EPA can state that under the selected regulatory options, the Final Rule will have no measurable impacts in terms of incremental closures or financial distress on any facilities in these subcategories.[1] Therefore, the TT/CHEM&PETR Direct, RT/CHEM&PETR Direct, TB/CHEM&PETR Indirect, and FOOD subcategories will not be further addressed in terms of impacts in this EA.

The subcategories that will be discussed in detail in the impact sections of this report are as follows:

- TT/CHEM&PETR Direct—322 facilities, of which 36 facilities are excluded, and 286 facilities are covered.

- RT/CHEM&PETR Indirect—41 facilities, of which 11 facilities are excluded, and 30 facilities are covered.

- TB/CHEM&PETR Direct—10 facilities, of which 3 facilities are excluded, and 7 facilities are covered.

Unless otherwise noted, discussion of impacts to the TT/CHEM&PETR and RT/CHEM&PETR subcategories in this chapter will include only indirect dischargers. Similarly, discussion of impacts to the TB/CHEM&PETR subcategory will include only direct dischargers. In addition, EPA found that Option A for TT/CHEM&PETR Indirects was not cost-effective, with a cost in excess of $2,200 per pound equivalent of pollutants removed (in 1981 dollars, U.S. EPA, 2000a). Therefore EPA did not evaluate economic impacts for this option.

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[1] Economic impacts on direct dischargers in the TT/CHEM&PETR and RT/CHEM&PETR subcategories were projected using data from indirect discharging facilities to create representative model facilities. This was because direct discharging facilities were identified through the Section 308 screener survey but not the Section 308 detailed questionnaire. Details on how these model facilities were selected are contained in the proposal EA report (U.S. EPA, 1998).

The impacts on existing sources in the above three subcategories are discussed subcategory by subcategory in Sections 5.2 through Section 5.4. Section 5.2 discusses total and average compliance costs by subcategory, Section 5.3 presents estimated impacts at the market level (that is, the estimated change in the market equilibrium price and quantity of tank cleanings performed before and after the imposition of incremental costs on the market model), and Section 5.4 presents impacts at the facility level. In this latter section, severe impacts are measured at the facility level on the basis of facility closures, employment losses, and revenue losses. Facilities not projected to close may, however, experience financial stress, which could create long-run difficulties for the financial viability of the business entity. Section 5.4 therefore continues with a financial ratio analysis of each facility=s parent business entity to identify additional impacts beyond facility closures. The facility-level analysis also includes the results of the sales test ratio, which compares facility annualized compliance costs to revenues. Section 5.5 presents EPA=s analysis of secondary impacts on the U.S. economy that result from the loss of output and employment within the TEC industry. Section 5.6 discusses incremental pollution control for new sources, and Section 5.7 summarizes results of the economic analyses for the selected options on the three regulated subcategories listed above. See Chapter 3 of this document and Appendices A through E of the proposal EA report (U.S. EPA, 1998) for details about the impact methodologies.

5.2 TOTAL AND AVERAGE COMPLIANCE COSTS

Table 5-1 presents total and average compliance costs in 1994 dollars by subcategory and technology alternative. The table includes estimated capital costs, annual operating and maintenance costs, and pre- and posttax annualized costs. EPA calculated annualized costs by combining the one-time capital expenditure with operating and maintenance costs over the 16-year project life. These annualized costs, which are analogous to home mortgage payment, represent the total project cost as 16 equal annual payments (Section 3.1). The annualized costs also include costs for periodic effluent monitoringCmonthly monitoring in the TT/CHEM&PETR and RT/CHEM&PETR subcategories and a combination of monthly and weekly monitoring for the TB/CHEM&PETR subcategory.

Total posttax annualized compliance costs range from $82,000 under Option 1 for TB/CHEM&PETR to $19.1 million under Option 2 for the TT/CHEM&PETR subcategory. Average posttax annualized costs calculated over those facilities that incur costs range from $12,000 per facility

TABLE 5-1

TOTAL AND AVERAGE COMPLIANCE COSTS BY SUBCATEGORY AND TECHNOLOGY OPTION

			Total			Average [1]		
Subcategory	Total in Class	Cost Type	Option 1	Option 2	Option 3	Option 1	Option 2	Option 3
TT/CHEM&PETR [2]	322	Capital	$51,430,699	$65,391,244		$179,828	$228,641	
		O&M	$8,030,113	$23,607,119		$28,077	$82,542	
		Post-tax Annualized	$8,367,490	$19,131,340		$29,257	$66,893	
		Pre-tax Annualized	$13,154,049	$30,048,722		$45,993	$105,065	
RT/CHEM&PETR [2]	41	Capital	$3,192,587	$7,037,479	$7,539,936	$106,420	$234,583	$251,331
		O&M	$496,023	$659,146	$1,497,614	$16,534	$21,972	$49,920
		Post-tax Annualized	$538,333	$928,086	$1,469,336	$17,944	$30,936	$48,978
		Pre-tax Annualized	$819,803	$1,376,703	$2,261,293	$27,327	$45,890	$75,376
TB/CHEM&PETR	10	Capital	$85,126	$1,797,019		$12,161	$256,717	
		O&M	$125,886	$316,086		$17,984	$45,155	
		Post-tax Annualized	$81,730	$315,796		$11,676	$45,114	
		Pre-tax Annualized	$133,610	$494,110		$19,087	$70,587	

[1] Average is calculated over 286 facilities in the TT/CHEM&PETR subcategory, 30 facilities in the RT/CHEM&PETR subcategory, and 7 facilities in the TB/CHEM&PETR subcategory, since the additional facilities in these subcategories are subject to the low-flow exclusion and incur no costs.

under Option 1 in the TB/CHEM&PETR subcategory to $67,000 per facility under Option 2 in the TT/CHEM&PETR subcategory.

EPA has selected Option 1 for TT/CHEM&PETR, with a total posttax annualized cost of $8.4 million per year (and an average cost per facility of $29,000 per year), Option 2 for RT/CHEM&PETR, at a total posttax annualized cost of $0.9 million per year (and an average cost per facility of $31,000 per year), and Option 1 for TB/CHEM&PETR, at a total posttax annualized cost of $82,000 per year (and an average cost per facility of $12,000 per year). Posttax annualized costs for the subcategories discussed here total $9.4 million per year. The posttax annualized costs for other subcategories not discussed in detail in this section add less than $0.1 million per year.

5.3 MARKET-LEVEL IMPACTS

The market model estimates the impact of compliance costs on cleanings performed and market price; it does not estimate impacts for individual commercial facilities that perform the cleanings. That is, the market model estimates the aggregate change in tank cleanings performed by a subcategory; however, it does not estimate whether the post-compliance decline in tank cleanings is attributable to the closure of one or more facilities, or to a small decrease in cleanings for many facilities. The market model also examines the decision by in-house facilities to upgrade their TEC wastewater treatment systems or to close their TEC operations (but not the entire facility) and outsource their tank cleaning to commercial facilities. Table 5-2 presents the estimated impact of regulatory compliance costs on baseline market price and quantity for each subcategory. EPA calculated baseline price and quantity directly from data from Part B of the detailed questionnaire (U.S. EPA, 1998).

Unless all facilities in a subcategory are already sufficiently treating their wastewater, imposing regulatory controls increases the average cost of tank cleaning. If all other factors remain equal,[2] this increased cost results in a decrease in the market supply of tank cleanings (shown in the third column of Table 5-2). The imposition of controls on in-house facilities provides incentive for these facilities to switch to commercial cleaners to avoid the increased costs. Such a change, should it occur, would result

[2] This assumption abstracts the analysis from other effects on the market, such as market growth or changes in wage rates, which are independent of the regulation. Thus, EPA does not assume a facility can avoid closure or other regulatory impacts through increased revenues from forecasted growth.

TABLE 5-2

ESTIMATED REGULATORY IMPACT ON MARKET PRICE AND QUANTITY BY SUBCATEGORY

	Baseline		Percent Shift in [1]		Final Equilibrium		% Change in Equilibrium	
Subcategor	Price	Quantit	Supply	Demand	Price	Quantit	Price	Quantit
TT/CHEM&PETR								
Option 1	$279	774,406	-2.05%	0.0%	$285	772,289	1.84%	-0.27%
Option 2	$279	774,406	-6.42%	0.0%	$296	767,938	5.75%	-0.84%
RT/CHEM&PETR								
Option 1	$781	32,989	-2.52%	0.0%	$800	32,869	2.45%	-0.36%
Option 2	$781	32,989	-4.42%	0.0%	$815	32,781	4.29%	-0.63%
Option 3	$781	32,989	-6.97%	0.0%	$834	32,666	6.77%	-0.98%
TB/CHEM&PETR								
Option 1	$6,448	12,078	-0.14%	0.0%	$6,456	12,077	0.13%	-0.01%
Option 2	$6,448	12,078	-0.54%	0.0%	$6,478	12,073	0.47%	-0.05%

[1] The vertical shift of the curve at the baseline equilibrium quantity expressed as a percentage of the baseline equilibrium price.

in an increase in demand (shown in the fourth column of Table 5-2). A decrease in supply, other things remaining constant, causes the market price to increase and the number of tank cleanings performed to decrease. An increase in demand, other things constant, causes the market price and the number of tank cleanings performed to increase. The combined effect of an increase in demand coupled with a decrease in supply is stronger upward pressure on prices; however, the combined effect tends to offset changes in the number of cleanings (Section 3.2).

The decrease in supply caused by the imposition of compliance costs ranges from 0.14 percent of baseline supply under Option 1 in the TB/CHEM&PETR subcategory to 6.97 percent under Option 3 in the RT/CHEM&PETR subcategory. Under the options presented in Table 5-2, there was no outsourcing of cleanings in any subcategory. The primary reason no outsourcing occurs is that many in-house facilities indicated in the detailed questionnaire that they would not outsource tank cleanings, regardless of compliance costs, for reasons of quality control, convenience, and liability. The decrease in supply causes an increase in postregulatory equilibrium price, ranging from 0.13 percent of baseline price under Option 1 for the TB/CHEM&PETR subcategory to 6.77 percent of baseline price under Option 3 for the RT/CHEM&PETR subcategory. The decrease in the postregulatory quantity of tank cleanings performed ranges from 0.01 percent to 0.98 percent. The pattern of impacts is consistent for all subcategories under all options: the impact on price is larger than the impact on quantity.

The pattern of impacts presented in Table 5-2 is attributable to a very inelastic demand for and a relatively elastic supply of tank cleaning services.[3] Estimates of the price elasticity of demand for transportation services range from -1.3 for truck transportation to -0.7 for barge transportation. Because the cost of tank cleaning services is a very small percentage of the cost of transportation services, the price elasticity of demand for tank cleaning services is a fraction of the demand elasticity for transportation. EPA's estimates of the elasticity of demand for TEC services therefore range from -0.15 for trucks to -0.1 for barges (Appendix B, proposal EA report, U.S. EPA, 1998). Thus, a 1 percent increase in price for tank truck TEC services, for example, will decrease the number of tank cleanings

[3] The price elasticity of demand is defined as the percentage decrease in quantity demanded caused by a 1 percent increase in price. The price elasticity of supply is defined as the percentage change in quantity supplied caused by a 1 percent change in price. Price elasticities are used to summarize the responsiveness of consumers/producers to changes in market conditions. An elasticity less than one indicates that an increase in price has relatively little impact on a consumer's decision on how much of a good to purchase or a producer's decision on how much of a good to supply. An elasticity greater than one indicates that a small price change will have a large impact on such decisions.

demanded by less than 0.2 percent; the impact falls primarily on price with relatively little effect on quantity.

Intuitively, demand is price inelastic for two reasons. First, there are few substitutes for TEC services; tanks need to be cleaned periodically and there are few ways to avoid this requirement. Second, TEC services make up a relatively small share of the cost of transportation services. The second reason for demand inelasticity reinforces the first. Tank cleaning is unavoidable; however, it comprises such a small share of overall transportation costs that users of TEC services have little incentive to undertake significant efforts to economize on TEC costs (as they might do if fuel prices, for example, increased significantly). The price inelasticity of demand implies that the industry has the potential to offset increased costs of incremental pollution control through higher prices. In other words, an inelastic demand curve implies that producers may pass through a significant percentage of compliance costs to their customers, who would rather pay the higher price than forego tank cleanings.

5.4 FACILITY-LEVEL IMPACTS

EPA has assessed the impact of compliance costs on the financial health and viability of TEC facilities using the closure model, financial ratio analysis, and the ratio of facility compliance costs to sales (the *sales test*). Section 5.4.1 presents projected incremental closures by subcategory and associated impacts (Section 3.3). Both the revenues generated by a facility and employment in the facility are assumed to be lost if a facility is projected as an incremental closure; these are the impacts associated with facility closure. Section 5.4.2 presents the results of EPA's financial ratio analysis; this analysis measures incremental financial distress short of closure. Section 5.4.3 presents the results of the sales test. The sales test examines the ratio of annualized compliance costs to facility revenues.

5.4.1 Facility Closure Analysis

Facility-level impacts are estimated using the closure model described in Chapter 3. The closure model addresses the impact of compliance costs on the financial health of the individual facility. In effect, the closure analysis models the financial evaluation a facility owner might make when deciding whether to upgrade pollution controls, or to close the facility because, with pollution controls in place, the facility is no longer economically viable.

Table 5-3 presents projected facility incremental closures and associated impacts by technology option and subcategory for the TEC industry assuming no costs can be passed through to customers.[4] Under the regulatory options selected for the Final Rule, no closures are expected to occur among any of the subcategories even if facilities are not able to pass through the regulatory costs of compliance, nor are revenue or employment losses projected. This finding also holds true for the subcategories not discussed in detail in this section.

5.4.2 Financial Ratio Analysis

EPA=s financial ratio analysis examines whether a company could afford the cost of upgrading all the TEC facilities that it owns. For companies that own more than one TEC facility, it could make economic sense to upgrade each facility, but the company may not be able to afford the total cost of upgrading all the facilities that it owns. Many banks use financial ratio analyses to assess the credit worthiness of a potential borrower. If the incidence of regulatory costs causes a company=s financial ratios to move into an unfavorable range, the company will find it more difficult to borrow money. Under these conditions, EPA considers the company and each facility that it owns to be experiencing Afinancial distress short of closure.@

Financial ratio analysis is performed at the level of the parent company. In general, major financial decisions are made at the company level, and the company is ultimately responsible for repayment of a loan. Furthermore, financial institutions assess credit-worthiness at the company level, not at the level of the facility.

The sampling frame was developed on the basis of facility attributes. Therefore it is not possible to develop statistical weights for business entity results and the number of financially distressed business

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[4] The proposal EA report (U.S. EPA, 1998) assumed costs can be passed through to customers. To be conservative, and because results under the selected regulatory options are not dramatically different if zero cost pass through is assumed, EPA is not emphasizing results of a positive cost pass through scenario.

TABLE 5-3

INCREMENTAL CLOSURES, REVENUE AND EMPLOYMENT LOSSES ASSUMING ZERO COST PASS THROUGH

			Losses due to Incremental Closures by Option					
Subcategor	Variable	Total in Class	Option 1	% of Class	Option 2	% of Class	Option 3	% of Class
TT/CHEM&PETR	Facilities	322	0	0.0%	0	0.0%		
	Revenues (millions)	$1,595.4	$0.0	0.0%	$0.0	0.0%		
	Employment	12,875	0	0.0%	0	0.0%		
RT/CHEM&PETR	Facilities	41	0	0.0%	0	0.0%	0	0.0%
	Revenues (millions) [2]	$61.8	$0.0	0.0%	$0.0	0.0%	$0.0	0.0%
	Employment [2]	2,190	0	0.0%	0	0.0%	0	0.0%
TB/CHEM&PETR[1]	Facilities	10	0	0.0%	0	0.0%		
	Revenues (millions) [3]	$51.4	$0.0	0.0%	$0.0	0.0%		
	Employment [3]	707	0	0.0%	0	0.0%		

[1] For 1 cost center, analysis defaults to the business entity level.
[2] Excludes facility revenues and employment for three facilities in the former RT/PETR subcategory due to data confidentiality issues; impacts on those facilities are included in the results reported for all indirect TT/CHEM&PETR facilities.
[3] Includes facility revenues and employment for five indirect discharging facilities in the TB/CHEM&PETR subcategory due to data confidentiality issues.

entities cannot be estimated (Denning, 1997). Instead, the impacts are passed to the facility level through the facility-level weights (Section 3.4).[5]

EPA selected a weighted average of financial ratios, called the Altman ZO-score, to characterize the baseline and post-regulation financial conditions of potentially affected firms (Section 3.4). The Altman ZO-score is a multidiscriminant function, originally developed to assess bankruptcy potential (Altman, 1993).[6] The ZO-score has advantages over consideration of an individual ratio or a collection of individual financial ratios for two reasons. First, it provides simultaneous consideration of liquidity, leverage, profitability, and asset ratios. Second, it addresses the problem of how to interpret data sets in which some financial ratios look Ahealthy@ while other ratios look Aunhealthy.@

Table 5-4 presents the results of the financial ratio analysis by option and subcategory. Incremental financial distress impacts are expected only for facilities in the TT/CHEM&PETR subcategory. Fourteen facilities are owned by business entities that may incur incremental financial distress under Option 1, while 22 are owned by businesses that incur financial distress under Option 2.

EPA also examined the current and times interest earned ratios to characterize the baseline and post-regulatory financial conditions of potentially affected firms. The current ratio, measured as the ratio of current assets to current liabilities, is a liquidity ratio; that is, it measures how much cash a firm has on hand to repay debt. Table 5-4 also presents incremental financial distress as measured by the current ratio.

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[5] For example, suppose a company owns one TEC facility, that facility has a weight of seven, and regulatory costs place the company in financial distress. This report would describe the impacts as seven facilities are owned by corporate parents that show financial distress, not seven businesses show financial distress.

[6] EPA uses the Altman ZO-score as an indication of financial distress, but not necessarily bankruptcy. A ZO-score below the Abankruptcy likely@ cutoff is a warning sign, not a determination of immediate bankruptcy. There is a time lag between a warning (i.e., low ZO-score) and actual bankruptcy. During this period, a company has the opportunity to change its behavior to avoid the projected bankruptcy. The Chrysler Corporation is such an example; Altman, 1993 cites other examples. If a business entity=s ZO-score falls below the Abankruptcy likely@ cutoff as a result of the rule, EPA considers the option to have caused financial distress. The company will likely have to change the way it does business to respond to the regulation.

TABLE 5-4

INCREMENTAL FINANCIAL DISTRESS
ALTMAN Z", CURRENT RATIO AND TIMES INTEREST EARNED ANALYSES

		Incremental Financial Distress by Option					
Subcategor	Total in Class [1]	Option 1	% of Class	Option 2	% of Class	Option 3	% of Class
Altman-Z" Analysis							
TT/CHEM&PETR	322	14	4.5%	22	7.0%		
RT/CHEM&PETR	41	0	0.0%	0	0.0%	0	0.00%
TB/CHEM&PETR	10	0	0.0%	0	0.0%		
Current Ratio Analysis							
TT/CHEM&PETR [2]	322	14	4.5%	22	7.0%		
RT/CHEM&PETR	41	0	0.0%	0	0.0%	0	0.00%
TB/CHEM&PETR	10	0	0.0%	0	0.0%		
TIE Analysis							
TT/CHEM&PETR [2]	322	0	0.0%	7	2.6%		
RT/CHEM&PETR	41	0	0.0%	0	0.0%	0	0.00%
TB/CHEM&PETR	10	0	0.0%	0	0.0%		

[1] For 9 facilities in the TT/CHEM&PETR subcategor
analysis was not conducted because insufficient data were provided.

Again, only facilities in the TT/CHEM&PETR subcategory are estimated to be affected using the current ratio measure. Fourteen facilities are owned by business entities that incur incremental financial distress under Option 1, and 22 facilities are owned by businesses that may incur financial distress under Option 2.

The times interest earned ratio, measured as the ratio of earnings before interest and taxes (EBIT) plus depreciation to interest payments, is a leverage ratio. It examines if a firm has sufficient income to meet interest payment obligations on outstanding debt. Table 5-4 also presents financial distress as measured by the times interest earned ratio.

Using this measure of financial distress, EPA estimates that under Option 1, for all subcategories, no major financial impacts are measured. Under Option 2 for the TT/CHEM&PETR subcategory, however, seven facilities are owned by business entities that may incur financial distress as a result of the rule.

Under the selected regulatory options, business entities associated with 14 facilities in the TT/CHEM&PETR subcategory (4.5 percent of the facilities in this subcategory or 3.8 percent of all facilities in the analysis), may face financial distress as a result of the Final Rule as measured by the Altman-ZO analysis and the current ratio analysis. No other impacts are discerned in the other subcategories using any of the above measures of financial stress.

Similar magnitudes of impacts are observed under two of the three financial ratios examined. Because the Altman ZO score examines a weighted average of four different ratios, and because it answers the question of what to do when some ratios look Ahealthy@ while other ratios look Aunhealthy,@ the Altman ZO results were emphasized in determining financial ratio impacts. The current ratio and times interest earned ratio provide additional evidence supporting the Altman ZO results, and indicate that financial distress impacts may be smaller than projected under the Altman ZO methodology.

5.4.3 Sales Test Results

In addition to projecting facility closures, employment losses, and financial distress, EPA examines other measures of economic achievability. One such measure is the *sales test*. The sales test is calculated as:

$$\frac{\textbf{pre- or posttax annualized compliance costs}}{\textbf{1994 facility revenues}}$$

EPA examines the number of facilities with compliance costs that exceed 1 percent of revenues and 3 percent of revenues to determine whether other impacts could occur. The results of the sales test calculated on the basis of posttax annualized costs assuming zero cost pass-through are presented in Table 5-5, along with results using pretax annualized costs. Posttax annualized costs represent the out-of-pocket expenses for the industry after tax shields, while pretax annualized costs are used as a proxy for the social cost of the regulation.

As can be observed by comparing Table 5-5 with Table 5-3, the sales test is a more sensitive measure of impacts than the closure model. Some of the difference is a result of using 1 year's data only in the sales test, while the closure model uses 3 years' data; a single year's data is more likely to contain extreme values than an average of 3 years' data. Also, the closure model is a cash flow analysis; cash flow is a more sophisticated measure of a facility's financial health than sales revenues. Finally, the sales test results are not associated with specific measurable impacts such as closure or financial distress. EPA uses the sales test as one measure of the burden of compliance costs to facilities, but does not project specific impacts to the financial health of facilities when compliance costs exceed either 1 or 3 percent of revenues.

In the TT/CHEM&PETR subcategory, under the selected regulatory option (Option 1), and using the worst-case pretax costs, up to 44 percent of the facilities in this subcategory incur compliance costs that exceed 1 percent of facility revenues, while about one-quarter incur costs that exceed 3 percent of revenues under the same option. With posttax costs, these percentages are lower.

TABLE 5-5

FACILITIES WITH POSTTAX OR PRETAX ANNUALIZED COSTS EXCEEDING SPECIFIED PERCENTAGE OF FACILITY REVENUES ASSUMING ZERO COST PASS THROUGH

			Threshold Exceedences					
Subcategor	Percent of Revenue	Total in Class	Option 1	% in Class	Option 2	% in Class	Option 3	% in Class
Posttax Costs								
TT/CHEM&PETR	1 Percent	322	100	31.1	188	58.4		
	3 Percent	322	65	20.2	100	31.1		
RT/CHEM&PETR	1 Percent	41	15	36.6	18	43.9	22	53.7
	3 Percent	41	0	0.0%	6	14.6	20	48.8
TB/CHEM&PETR	1 Percent	10	3	30.0	4	40.0		
	3 Percent	10	0	0.0%	1	10.0		
Pretax Costs								
TT/CHEM&PETR	1 Percent	322	140	43.5	213	66.1		
	3 Percent	322	79	24.5	115	35.7		
RT/CHEM&PETR	1 Percent	41	15	36.6	22	53.7	22	53.7
	3 Percent	41	6	14.6	13	31.7	20	48.8
TB/CHEM&PETR	1 Percent	10	4	40.0	4	40.0		
	3 Percent	10	0	0.0%	4	40.0		

[1] For 9 cost centers, the sales test is undefined.
[2] For 5 cost centers, the sales test is undefined.

About 54 percent of the facilities in the RT/CHEM&PETR subcategory incur costs exceeding the 1 percent threshold under the selected regulatory option (Option 2). About 32 percent of facilities in this subcategory incur costs exceeding the 3 percent threshold under this option.

About 40 percent of facilities in the TB/CHEM&PETR subcategory incur costs exceeding the 1 percent threshold under the selected regulatory option (Option 1). No facilities incur costs exceeding the 3 percent threshold under this option.

Altogether, under the selected regulatory options, at most (under the conservative pretax cost with zero cost pass-through scenario) 166 facilities will face compliance costs exceeding 1 percent of revenues (45 percent of all facilities in this analysis), and 92 facilities (25 percent) will face compliance costs exceeding 3 percent of revenues.

5.5 SECONDARY IMPACTS

This section assesses national and regional output and employment impacts resulting from compliance with the proposed effluent limitations guidelines for the TEC industry. Compliance costs decrease the output of the TEC industry, which may cause a loss in TEC employment.[7] The decrease in TEC output decreases the demand for products in industries that supply inputs to the TEC industry. As a result, these industries may suffer reduced output and employment as well. However, the need to manufacture, install, operate and maintain the pollution control equipment required under the new regulation may generate increased economic activity in other industries. This increase in economic activity resulting from compliance with the regulation can result in output and employment gains that offset the losses caused by the regulation. The impacts to output and employment in non-TEC industries caused by the regulation of the TEC industry are called secondary impacts.

Secondary impacts are estimated based upon the decrease in TEC services projected by the market model. (There are no estimated closures under the proposed options.) Section 5.5.1 presents estimates of secondary output and employment losses, offsetting secondary output and employment gains, and net impacts on the national economy. Section 5.5.2 analyzes regional impacts caused by the

[7] The loss in employment is measured in Afull-time-equivalent@ (FTE) jobs, where one FTE equals 2,080 labor hours or 1 person-year of employment.

TEC regulation. Due to the uncertainties involved with applying IO multipliers to the TEC industry, EPA provides a range of secondary impact estimates. The assumption that the supply of TEC services is perfectly inelastic provides a lower bound estimate of secondary impacts; the assumption that the supply of TEC services is perfectly elastic provides an upper bound estimate (Section 3.5).

5.5.1 Estimates of National Employment and Output Impacts

The left-hand panel of Table 5-6 presents estimates of the impact of the proposed TEC regulation on national output. Estimated losses to U.S. Gross Domestic Product (GDP), including direct, indirect, and induced impacts, range from $43.7 million (0.001 percent of 1994 U.S. GDP [U.S. Department of Commerce, 1996]) to $50.0 million (0.001 percent of 1994 U.S. GDP) in 1994 dollars. Impacts to U.S. employment range from 531 to 608 FTE job losses nationwide (less than 0.005 percent of the 1994 U.S. labor force [U.S. Bureau of the Census, 1995]). Of these job losses, from 29 to 195 are projected to occur directly in the TEC industry (from 0.07 percent to 0.44 percent of TEC industry employment). Because most of the regulatory costs are passed through to customers under the assumption of perfectly elastic supply, the impact on TEC employment alone is much smaller than under perfectly inelastic supply.

The center panel of Table 5-6 provides estimates of secondary output and employment gains due to the purchase of wastewater treatment equipment and to associated operating and maintenance expenditures. The potential gain from compliance expenditures is $25.9 million per year (0.0004 percent of 1994 U.S. GDP), including direct, indirect, and induced impact, regardless of elasticity assumptions. The potential gains in employment total approximately 321 FTEs (0.002 percent of the 1994 U.S. labor force) when direct, secondary, and induced impacts are totaled. Employment gains in the TEC industry due to O&M labor expenditure may total as many as 154 FTEs; these jobs would help offset projected employment losses.

The right-hand panel of Table 5-6 provides a summary of net secondary impacts. Assuming perfectly inelastic supply of TEC services, the possible secondary gains attributable to the regulation offset the losses such that the net loss is reduced to $17.8 million of GDP (0.0003 percent of 1994 U.S. GDP), while the net loss in jobs is reduced to a total of 210 FTE jobs nationwide (0.002 percent of 1994 U.S. labor force) and 41 FTE jobs within the TEC industry (0.09 percent of TEC employment). Under

TABLE 5-6

SECONDARY IMPACTS OF TEC INDUSTRY REGULATION ON NATIONAL OUTPUT AND EMPLOYMENT UNDER THE SELECTED REGULATORY OPTIONS

Subcategor	Loss in 1994 U.S. GDP ($millions)	Loss in 1994 U.S. Employment	Loss in 1994 TEC Services Employment	Gain in 1994 U.S. GDP ($millions)	Gain in 1994 U.S. Employment	Gain in 1994 TEC Services Employment	Net Loss, 1994 U.S. GDP ($millions)	Net Loss, 1994 U.S. Employment	Net Loss, 1994 TEC Services Employment
Perfectly Inelastic Supply									
TT/CHEM&PETR	$39.4	492	185	$22.9	283	139	$16.5	209	47
RT/CHEM&PETR	$3.8	35	8	$2.5	33	15	$1.3	2	(6)
TB/CHEM&PETR	$0.4	4	1	$0.4	5	0	$0.0	(1)	1
Total	$43.7	531	195	$25.9	321	154	$17.8	210	41
Percent	*0.001%*	*0.004%*	*0.44%*	*0.0004%*	*0.002%*	*0.35%*	*0.0003%*	*0.002%*	*0.09%*
Perfectly Elastic Supply									
TT/CHEM&PETR	$45.1	563	28	$22.9	283	137	$22.2	280	(109)
RT/CHEM&PETR	$4.4	41	1	$2.5	33	15	$1.9	7	(13)
TB/CHEM&PETR	$0.4	4	0	$0.4	5	0	$0.0	(1)	0
Total	$50.0	608	29	$25.9	321	152	$24.1	287	(123)
Percent	*0.001%*	*0.005%*	*0.07%*	*0.0004%*	*0.002%*	*0.34%*	*0.0003%*	*0.002%*	*-0.28%*

Numbers may not sum to total due to rounding.

the assumption of perfectly elastic supply, the projected net loss to GDP totals $24.1 million (0.0003 percent of 1994 U.S. GDP), 287 FTEs are lost nationwide (0.002 percent of 1994 U.S. labor force), and there is a net employment *gain* of 123 FTEs within the TEC industry (0.28 percent of TEC employment).

5.5.2 Regional Impacts

Because the TEC industry detailed questionnaire was sent to a sample of TEC facilities stratified by type of tank cleaned and certain financial characteristics, EPA cannot determine the geographical distribution of TEC facilities with any degree of statistical confidence. In addition, the closure model projects no facility closures under the selected options,[8] and market model projections of impacts provide no means of ascertaining how these aggregate impacts are distributed across facilities. For these reasons, it is impossible for EPA to accurately project impacts to any particular geographical region.

It is possible, however, to provide a worse-case scenario for regional impacts by assuming that all negative impacts occur within the confines of the smallest state. This method overestimates impacts for several reasons: First, it is known that not all TEC facilities are in the same state and it is highly unlikely that all secondary impacts would be confined to one state as well. Second, if all impacts actually occurred in larger states, they would affect a smaller percentage of those states’ output and employment. Third, no positive secondary impacts are assumed to occur in the same state as the negative impacts.

Table 5-7 presents direct and total regulatory impacts as a percentage of state output and employment. The state with the smallest 1994 GDP was Vermont, with an output of $13.3 billion (U.S. Department of Commerce, 1997). The largest projected decrease in total output comprises about 0.4 percent of Vermont’s GDP. In 1994, Alaska had the smallest labor force in the United States, with 305,000 workers (U.S. Bureau of the Census, 1996). Under the worst case scenario, total estimated employment impacts are about 0.2 percent of Alaska’s labor force.

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[8] In previous EAs, projected facility closures have been used to estimate regional and community impacts.

TABLE 5-7

ESTIMATED SECONDARY REGIONAL IMPACTS OF TEC INDUSTRY REGULATION UNDER THE SELECTED REGULATORY OPTIONS

Subcategory	Estimated Decrease in TEC Services 1994 Output ($millions)	Percent of 1994 Vermont GDP[2]	Estimated Decrease in 1994 U.S. GDP ($millions) [1]	Percent of 1994 Vermont GDP[2]	Estimated Decrease in TEC Services Employment[1]	Percent of 1994 Alaskan Labor Force[3]	Estimated Decrease in U.S. Employment[1]	Percent of 1994 Alaskan Labor Force[3]
Perfectly Inelastic Supply								
TT/CHEM&PETR	$13.2	0.10%	$39.4	0.30%	185	0.06%	492	0.16%
RT/CHEM&PETR	$1.4	0.01%	$3.8	0.03%	8	0.003%	35	0.01%
TB/CHEM&PETR	$0.1	0.001%	$0.4	0.003%	1	0.000%	4	0.001%
Total	$14.7	0.11%	$43.7	0.33%	195	0.06%	531	0.17%
Perfectly Elastic Supply								
TT/CHEM&PETR	$2.0	0.02%	$45.1	0.34%	28	0.01%	563	0.19%
RT/CHEM&PETR	$0.2	0.002%	$4.4	0.03%	1	0.000%	41	0.01%
TB/CHEM&PETR	$0.0	0.00%	$0.4	0.003%	0	0.000%	4	0.001%
Total	$2.2	0.02%	$50.0	0.38%	29	0.01%	608	0.20%

[1] Results taken from Table 5-6.
[2] In 1994 the State of Vermont had the smallest state GDP: $13.28 billion.
[3] In 1994 the State of Alaska had the smallest labor force in the Unites States: 305,000.

5.6 NEW SOURCE PERFORMANCE STANDARDS AND PRETREATMENT STANDARDS FOR NEW SOURCES

For New Source Performance Standards (NSPS) and Pretreatment Standards for New Sources (PSNS), EPA is proposing the following options for the Truck Chemical, Rail Chemical, Barge Chemical and Petroleum, and all Food subcategories:

- TT/CHEM&PETR Direct—NSPS=Option 2
- TT/CHEM&PETR Indirect—PSNS=Option 1
- RT/CHEM&PETR Direct—NSPS=Option 2
- RT/CHEM&PETR Indirect—PSNS=Option 2
- TB/CHEM&PETR Direct—NSPS=Option 1
- TB/CHEM&PETR Indirect—PSNS=Option 2
- FOOD—NSPS=Option 2

After considering the cost of NSPS/PSNS technology for new source facilities, EPA concluded that such costs were not sufficient to present a barrier to entry. The cost of NSPS/PSNS technology is a small fraction of the capital cost for a new facility; therefore, if a new facility is able to start up, it will have sufficient capital to meet these costs. For all subcategories, EPA is setting new source standards equivalent to existing source standards; the standards for existing facilities have been found to be economically achievable and pose no barrier to entry for new facilities. The costs of incorporating the selected NSPS/PSNS technology as a facility is built are substantially less than the costs of retrofitting existing facilities. EPA anticipates no barrier to entry for new facilities employing these technologies at lower cost.

Table 5-8 presents the ratio of estimated capital compliance costs to both facility assets and facility TEC assets for the TT/CHEM&PETR Indirect, RT/CHEM&PETR Indirect, and TB/CHEM&PETR Direct subcategories. Average facility assets serve as a proxy for the capital requirements for building a new facility containing TEC operations. Although the ratio of capital compliance costs to existing TEC capital is quite sizable in the TT/CHEM&PETR subcategory, the relevant parameter for a decision-maker is how much the regulation adds to the capital cost of building

TABLE 5-8

BARRIERS TO ENTRY
RATIO OF CAPITAL COMPLIANCE COSTS TO FACILITY ASSETS

	All Facility Assets				TEC Assets			
Subcategory[1]	Facilities Providing Data	Average Compliance Capital Cost	Average Facilit Assets	Ratio of Capital Costs to Facility Assets	Facilities Providing Data	Average Compliance Capital Cost	Average TEC Assets	Ratio of Capital Costs to TEC Assets
TT/CHEM&PET	232	$179,828	$2,259,644	8.0%	187	$179,828	$394,061	45.6%
RT/CHEM&PETR	20	$234,583	$4,914,343	4.8%	28	$234,583	$809,758	29.0%
TB/CHEM&PETR[2]	7	$12,161	$3,030,661	0.4%	11	$12,161	$3,030,661	0.4%

[1] Some facilities did not provide sufficient data for both the facility assets analysis and TEC assets analysis. Therefore, average capital compliance costs are not equal for the two analyses.
[2] Results for indirect dischargers are included in average assets to maximize data.

the entire facility. The ratio of estimated capital compliance costs to facility assets is less than 8 percent for all subcategories. EPA expects that incremental TEC capital costs to meet new source standards will be less than 8 percent of the capital costs for building a new facility.

5.7 SUMMARY AND OBSERVATIONS

Table 5-9 presents a summary of the costs and impacts of the options selected for the Final Rule. Under the selected options for each subcategory, no facilities are projected to close. The financial ratio analysis indicates that under the selected regulatory options, fewer than 4 percent of all facilities are expected to experience financial distress over all options. The sales test, a more sensitive measure of impacts, indicates that, under the selected option for each subcategory and assuming no costs can be passed through, 32 percent of all facilities analyzed incur posttax annualized costs that exceed 1 percent of revenues; 19 percent of facilities exceed the 3 percent threshold. In general, the market level analysis projects a maximum decrease in tank cleanings of less than 1 percent for any subcategory.

Thus, although the industry generally will sustain relatively high costs with respect to revenues, the industry is sufficiently financially healthy that it can absorb these costs with relatively few major impacts, even if no costs can be passed through to customers.

5.8 REFERENCES

Denning. 1997. Business entity weights. Phone call from George Denning, EPA, WAM, to Calvin Franz, ERG. Memo to TEC Industry Project File. April 22.

U.S. Bureau of the Census. 1995. Statistical abstract of the United States, 1995 (115th edition). Washington, DC: U.S. Bureau of the Census.

U.S. Bureau of the Census. 1996. Statistical abstract of the United States, 1996 (116th edition). Washington, DC: U.S. Bureau of the Census.

U.S. Department of Commerce. 1996. Improved estimates of gross domestic product by industry, 1959-1994. Survey of Current Business. 76(8):133.

U.S. Department of Commerce. 1997. Comprehensive revision of gross state product by industry, 1977-1994. Survey of Current Business. 77(6):15.

TABLE 5-9

SUMMARY OF IMPACTS UNDER SELECTED REGULATORY OPTIONS

					Impacts			
							Sales Test [1]	
Subcategory	Option	Total in Class	Cost Type	Cost	Closures	Financial Distress	1 Percent Threshold	3 Percent Threshold
TT/CHEM&PET	Option 1	322	Capital	$51,430,699	0	14	100	65
			O&M	$8,030,113				
			Post-tax Annualized	$8,367,490				
			Pre-tax Annualized	$13,154,049				
RT/CHEM&PET	Option 2	41	Capital	$7,037,479	0	0	18	6
			O&M	$659,146				
			Post-tax Annualized	$928,086				
			Pre-tax Annualized	$1,376,703				
TB/CHEM&PET	Option 1	10	Capital	$85,126	0	0	3	0
			O&M	$125,886				
			Post-tax Annualized	$81,730				
			Pre-tax Annualized	$133,610				

[1] Posttax annualized cost/facility revenues.

U.S. EPA. 1998. Economic Analysis of Proposed Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA 821/B-98-012. Washington, DC: U.S. Environmental Protection Agency, Office of Water. May.

U.S. EPA. 2000a. Cost-Effectiveness Analysis of Final Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA-821-R-00-014. Washington, DC: U.S. Environmental Protection Agency, Office of Water. June.

U.S. EPA. 2000b. Summary of Economic Impacts to TT/CHEM&PETR Directs, RT/CHEM&PETR Directs, and TB/CHEM&PETR Indirects. CBI Memorandum in the Rulemaking Record.

CHAPTER 6

SMALL BUSINESS ANALYSIS

6.1 INTRODUCTION

This chapter analyzes the projected effects of incremental pollution control costs on small business entities. Under the Regulatory Flexibility Act (R.A., 5 U.S.C. 601 et seq., Public Law 96-354) as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), government agencies are required to analyze regulatory impacts on small entities. The R.A. acknowledges that small entities have limited resources and makes it the responsibility of the regulating federal agency to avoid burdening such entities unnecessarily. *EPA is certifying that the TEC Final Rule will not have a significant impact on a substantial number of small entities*, and therefore is not required to present a final regulatory flexibility analysis under the R.A.. However, EPA is responsive to the intent of the R.A. and presents in Chapter 6 its assessment of the impacts of the TEC Final Rule on small business entities.

Section 6.2 reviews the steps in Agency guidance to determine whether presentation of a regulatory flexibility analysis is required and how to identify significant impacts on small businesses. Section 6.3 responds to the regulatory flexibility analysis components for a proposed rule required by Section 603 of the R.A.. Sections 6.4 and 6.5 are a detailed description of the small business economic analysis performed for the proposed regulation.

6.2 INITIAL ASSESSMENT

The following initial steps in assessing impacts on small entities are posed as a series of questions and answers:

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

The Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry Point Source Category are subject to notice-and-comment rulemaking requirements.

- # What is the Profile of Affected Entities?

  EPA prepared a profile of the regulated universe of entities, see Chapter 2 and Section 6.3.

- # 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 may incur costs for incremental pollution control as a result of the rule. EPA examines the adverse impacts of these additional costs in Section 6.4.

6.3 REGULATORY FLEXIBILITY ANALYSIS COMPONENTS

Section 603 of the R.A. requires that an FRFA must contain the following:

- # State the need for and objective of the rule.
- # Summarize the significant issues raised by public comments on the initial regulatory flexibility analysis (IRFA) and the Agency's assessment of those issues, and describe any changes in the rule resulting from public comments.
- # Describe the steps the Agency has taken to minimize the significant economic impact on small entities consistent with the stated objectives of the applicable statutes, including statement of the factual, policy, and legal reasons for selecting the alternatives adopted in the final rule and why each one of the other significant regulatory alternatives to the rule considered by the Agency which affect the impact on small entities was rejected.
- # Describe/estimate the number of small entities to which the rule will apply or explain why no such estimate is available.
- # Describe the projected reporting, recordkeeping, and other compliance requirements of the rule, including an estimate of the classes of small entities that will be subject to the requirements of the rule.

The following sections address these issues.

6.3.1 Need for and Objectives of the Rule

The rule is being promulgated under the authority of Sections 301, 304, 306, 307, 308, and 501 of the Clean Water Act (CWA), 33 U.S.C. Sections 1311, 1314, 1316, 1317, 1318, and 1361. Under these sections, EPA sets effluent limitations guidelines and pretreatment standards to control the discharge of pollutants to U.S. surface waters. The TEC regulations also are being promulgated 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 (Federal Register, September 4, 1998, Vol. 63 No. 172, pp. 47285-47288).

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 301(b)(1) and 304(b)(1) authorize EPA to issue BPT effluent limitations guidelines. Section 304(b)(4) authorizes EPA to issue BCT guidelines for conventional pollutants; Sections 301(b)(2)(E) and 304(b)(2) authorize EPA to issue BAT guidelines to control nonconventional and toxic pollutants; Section 306 authorizes EPA to issue NSPS for all pollutants; and Sections 304(g) and 307(b) authorize EPA to issue PSES and PSNS for all pollutants.

6.3.2 Significant Issues Raised by Public Comments on the IRFA

Commenters on the proposed rule and notice of data availability (NOA) suggested that EPA adopt a low flow exclusion of 100,000 gallons per year. Other, more general comments included those to simplify subcategorization, limits, scope, and options. Commenters also strongly suggested that EPA promulgate concentration-based rather than mass-based limits.

6.3.3 Steps the Agency Has Taken to Minimize Significant Economic Impact on Small Entities

EPA took steps to minimize the regulatory burden associated with the rulemaking. First, EPA subcategorized the TEC industry to tailor the pollution control requirements for each group. Second, EPA considered multiple regulatory alternatives within subcategories when making its determination of economic achievability. Third, EPA performed a small business analysis of all alternatives considered for each subcategory. The regulatory alternatives that EPA has considered are discussed in Sections 6.5.1 through 6.5.5 of the proposal EA report (U.S. EPA, 1998). Finally, EPA has developed a small flow exclusion, which excludes a number of small entities, as discussed below. EPA decided to adopt a low flow exclusion for facilities discharging less than 100,000 gallons per year. The low flow exclusion exempts 51 total facilities, of which seven are associated with small businesses. EPA also has simplified the subcategorization scheme by combining subcategories—making the rule simpler—and has determined that the indirect dischargers associated with cleaning of food transportation equipment and all facilities cleaning hoppers do not warrant regulation. These decisions eliminate many small entities from the scope of the Final Rule. EPA's adoption of concentration-based limits rather than mass-based limits will make it easier for POTWs, including those owned by small municipalities, to calculate permit limits.

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

For the purpose of being responsive to the intent of the R.A., EPA defines a "small" business in the TEC industry as having less than $5 million in annual revenues (see Section 6.3.2.1 of the proposal EA report, U.S. EPA, 1998). This limit for the definition restricts the number of businesses classified as "small," but each affected business represents a larger proportion of small businesses (i.e., relative impacts may be magnified).

The industry profile discusses the relationship between two types of facilities that perform TEC operations: potentially affected facilities discharge wastewater while ZDT facilities do not. Furthermore, only a fraction of the industry defined as TEC at proposal will actually be regulated. In the IRFA for the proposed regulation, EPA chose to limit the universe for the small business analysis to facilities that discharge wastewater. EPA has further limited this universe in this analysis of the Final Rule to those facilities that discharge wastewater and that are regulated.

The detailed questionnaire requested information for both the facility and the business entity that owns the facility. Based on the parent business entity data, EPA determined whether facilities are owned by large or small business entities. The detailed questionnaire also indicated the structure of each facility's corporate hierarchy; EPA determined from this data that in many instances the facility is identical to the business entity ("stand alone" business). EPA was therefore able to estimate the number of stand alone business entities and the number of facilities owned by a larger business entity (which itself may be a "small business") in the TEC industry.

The sampling frame for the detailed questionnaire was stratified on the basis of facility characteristics. Thus, it is possible to identify stand alone small businesses and "facilities owned by small businesses" while not being able to estimate of the number of small businesses (see proposal EA report, Section 2.3 and Appendix D, U.S. EPA, 1998). Therefore, the number of potentially affected small entities and impacts to those entities are estimated using facility level weights. This will lead to an accurate count of stand alone businesses, but may overestimate the number of and impacts to facilities owned by larger entities.[1]

Table 6-1 presents the number stand alone businesses, the number of facilities that are owned by a larger entity, and the total number of entities in each business size category for the TT/CHEM&PETR Indirect, RT/CHEM&PETR Indirect, and TB/CHEM&PETR Direct subcategories. A total of 97 regulated entities (26 percent) are small businesses or facilities owned by small businesses as defined by the $5 million standard. Of those 97 small entities, 65 are stand alone businesses (67 percent) and the remaining 32 (33 percent) are owned by small businesses. The subcategory with the highest percentage of small entities is the TB/CHEM&PETR Direct subcategory (about 60 percent are small).[2] However, there are only 10 facilities in this subcategory.

[1] Through statistical weighting, each detailed questionnaire observation may represent several facilities. Because some business entities own many facilities, an observation with a weight representing seven facilities, for example, may represent only one or two parent business entities (U.S. EPA, 1998).

[2] As in earlier chapters of this report, EPA does not discuss results for the TT/CHEM&PETR Direct, RT/CHEM&PETR Direct, and TB/CHEM&PETR Indirect subcategories due to confidential business information disclosure issues. Of the nine facilities in these subcategories, four are small entities. Impacts on these small entities are minimal and do not affect EPA's assessment of the economic achievability of the rule. Results for these subcategories are documented in U.S. EPA, 2000b, which is a CBI document in the Rulemaking Record. Direct and indirect dischargers in the HOPPER subcategories are not regulated, nor are indirect dischargers in the FOOD subcategory, while FOOD Direct is associated with no costs or impacts.

TABLE 6-1
TEC FACILITIES BY SUBCATEGORY AND BUSINESS SIZE

	Small-Business Owned Entities				Large-Business Owned Entities				
Subcategor	Facility is Business	Facility is not Business	Total Entities	% of Subcategor	Facility is Business	Facility is not Business	Total Entities	% of Subcategor	Total
TT/CHEM&PETR [1]	53	27	79	24.5%	54	189	243	75.5%	322
RT/CHEM&PETR [1]	10	2	12	29.3%	0	29	29	70.7%	41
TB/CHEM&PETR [2]	3	3	6	60.0%	3	1	4	40.0%	10
Total [3]	65	32	97	26.0%	57	220	276	74.0%	373

Numbers may not sum to total due to rounding.
Entity is small business-owned if parent business entity earned less than $5 million in 1994 revenues.
[1] Includes indirect dischargers from detailed questionnaire only;
excludes direct dischargers from screener questionnaire due to confidential business information disclosure issues.
[2] Includes direct dischargers from detailed questionnaire only;
excludes indirect dischargers from detailed questionnaire due to confidential business information disclosure issues.
[3] Of the 9 total facilities in the TT/CHEM&PETR direct, RT/CHEM&PETR direct, and TB/CHEM&PETR indirect subcategories, 4 are small business owned.

6.3.5 Description of the Reporting, Recordkeeping, and Other Compliance Requirements

To conduct a small business analysis, EPA assumes that regular monthly monitoring for indirect discharging facilities and a combination of monthly and weekly monitoring for direct discharging facilities (see Chapter 4) will be required in addition to technology options. Monitoring requirements add costs but do not increase pollutant removals from a properly operated technology. Chapter 5 presents costs for pollution control options that include the costs of these monitoring requirements. Personnel skills, training, and time requirements needed to perform the recordkeeping requirements are included in the estimated costs for the rule and are described in the Development Document (U.S. EPA, 2000a) accompanying the Final Rule. Chapter 4 of this report and the Development Document also contain a description of the other compliance requirements.

6.4 SMALL BUSINESS ANALYSIS

The analysis contained in Section 6.4 demonstrates that the regulation will not have a significant impact on a substantial number of small entities.

6.4.1 Sales Test

EPA uses the sales test—annualized compliance costs as a percentage of revenues (Section 5.4.3)—as one method of screening whether the proposed rule's perceived significant impact on a substantial number of small entities. EPA first performed the sales test under a conservative set of assumptions by examining the ratio of pretax annualized costs to revenues in order to determine the need to prepare an FRFA. EPA subsequently performed the sales test incorporating less conservative but more realistic assumptions using the posttax annualized compliance costs. EPA examined sales test results using both the conservative zero cost pass through assumption, and the more realistic positive cost pass through assumption.

Cost Pass Through

Cost pass through is measured as the expected change in market price expressed as a percentage of the estimated compliance costs per tank cleaned. Thus, if per tank compliance costs are, for example, $10, and the market model projects a $6 increase in the market price of tank cleanings, the cost pass through is 60 percent (see proposal EA report, Appendix B for details, U.S. EPA, 1998). In general, the percentage of costs that may be passed through depends on the customers' willingness to pay a higher price rather than forgo purchasing that product or service, and the suppliers willingness to accept a lower (post regulatory) per unit price rather than forgo supplying that product or service. This willingness is reflected in the relative price elasticities of supply and demand. For TEC services, the estimated price elasticity of demand is quite inelastic, reflecting that tank cleaning is an essential part of supplying bulk liquid transportation services; transportation providers must be able to ensure that product will not be contaminated by previous cargos if they wish to retain customers. Thus, in the TEC industry estimated cost pass through will be relatively high.

Note that the concept of cost pass through does not mean any individual TEC facility, or carrier with in-house TEC facilities, can increase price at will. If an individual facility attempts to charge a higher price to its customers when all other facilities maintain their current prices, that facility will lose business to its competitors. It is because all facilities in the industry incur compliance costs, and therefore all feel the pressure to increase price, that results in the industry passing through some percentage of its cost increase to its customers. The facility's, or carrier's, customers do not have incentive to change to a competitor because that competitor will also have had to increase price. The fuel surcharge many carriers charged in response to increased diesel fuel prices in winter of 1999-2000 illustrates that the trucking industry has successfully passed through some percentage of cost increases to their customers when they were able to make a strong case to their customers that those cost increases were legitimate (MBT, 2000).

Zero cost pass through for the industry will only occur under two possible circumstances: (1) if market demand is perfectly elastic (a horizontal demand curve), or (2) if market supply is perfectly inelastic (a vertical supply curve). Neither scenario is plausible in the case of the TEC industry. First, EPA has estimated that the price elasticity of demand for TEC services is less than -0.2 (i.e., very inelastic) in all subcategories and are significantly smaller than the price elasticity of supply in each subcategory (elasticity estimates are documented in DCNs T20394 and T20468). Second, the implications for consumer and producer behavior of perfectly elastic demand and perfectly inelastic supply are contrary to how the TEC industry operates. A perfectly elastic demand curve for TEC services implies that the number of tank cleanings performed by the industry will fluctuate independently of the quantity of transportation services provided (i.e., with no change in the number of tank shipments transported, customers change the number of tank cleanings purchased even though the price of TEC services remains unchanged). A perfectly inelastic supply curve implies no fluctuation in the number of tank cleanings performed regardless of the quantity of transportation services provided (i.e., suppliers of TEC services provide the same number tank cleanings no matter how high a price customers are willing to pay to purchase more cleanings). The conditions necessary for zero cost pass through to occur in response to the imposition of regulatory costs are not met in the TEC industry; positive cost pass through is a more realistic model of how the industry operates.

EPA estimated facility specific effective cost pass through percentages that incorporate not only the market model cost pass through, but the facility share of commercial cleanings as well (see Section 3.3.2 of this document, and Appendix C of the proposal EA report, U.S. EPA, 1998). The average estimated effective cost pass through in each subcategory is:

- TT/CHEM&PETR: 29.7 percent
- RT/CHEM&PETR: 36.1 percent
- TB/CHEM&PETR: 42.7 percent.

The sales test results incorporating cost pass through (Tables 6-3 and 6-5) are calculated using facility-specific individual effective cost pass through percentages.

6.4.1.1 Sales Test with Pretax Annualized Costs

Table 6-2 presents the results of the sales test based on pretax annualized costs by subcategory and small business status. Under the selected regulatory options (Option 1 for TT/CHEM&PETR and TB/CHEM&PETR; Option 2 for RT/CHEM&PETR), approximately 37 percent of small businesses in the TT/CHEM&PETR subcategory (29 facilities) will experience costs exceeding 3 percent of revenues. For the RT/CHEM&PETR subcategory, the selected option results in an estimated three quarters of small

TABLE 6-2

ENTITIES WITH PRETAX ANNUALIZED COSTS EXCEEDING SPECIFIED PERCENTAGE OF REVENUES BY BUSINESS SIZE ASSUMING ZERO COST PASS THROUGH

				Threshold Exceedences					
Subcategory	Percent of Revenue	Business Size	Total in Class	Option 1	% of Class	Option 2	% of Class	Option 3	% of Class
TT/CHEM &PETR [1]	1%	Small	79	29	36.7%	43	54.4%		
		Other	243	112	46.1%	170	70.0%		
	3%	Small	79	29	36.7%	36	45.6%		
		Other	243	50	20.6%	79	32.5%		
RT/CHEM&PETR [2]	1%	Small	12	6	50.0%	9	75.0%	9	75.0%
		Other	29	8	27.6%	13	44.8%	13	44.8%
	3%	Small	12	0	0.0%	6	50.0%	6	50.0%
		Other	29	6	20.7%	6	20.7%	13	44.8%
TB/CHEM&PETR [3]	1%	Small	6	3	50.0%	3	50.0%		
		Other	4	1	25.0%	1	25.0%		
	3%	Small	6	0	0.0%	3	50.0%		
		Other	4	0	0.0%	1	25.0%		

Entity is small business-owned if parent business entity earned less than $5 million in revenues in 1994.
Results not included for TT/CHEM&PETR direct dischargers, RT/CHEM&PETR direct dischargers, or TB/CHEM&PETR indirect dischargers due to confidential business information disclosure issues.
Any impacts to the 4 nondisclosure facilities in these subcategories would not change EPA's assessment of the economic achievability of the rule.
[1] For 9 cost centers, the sales test is undefined.
[2] For 10 cost centers, the sales test is undefined.
[3] For 1 cost center, the sales test is undefined.

businesses experiencing costs exceeding 1 percent of revenues, with about half experiencing costs exceeding 3 percent of revenues. Under the selected option for TB/CHEM&PETR, about half of small businesses will experience costs exceeding 1 percent of revenues, but none will experience costs exceeding 3 percent of revenues.

These results are considered a worst-case scenario, since facilities will be able to a expense or depreciate a portion of compliance costs, thus providing a tax savings, and it is assumed that zero costs are passed through to customers. Table 6-3 presents the pretax sales test results assuming positive cost pass through. Under the selected option, seven small business owned TT/CHEM&PETR facilities are expected to incur compliance costs exceeding 3 percent of revenues. Zero small business owned RT/CHEM&PETR and TB/CHEM&PETR facilities are expected to incur costs exceeding the 3 percent threshold.

6.4.1.2 Sales Test with Posttax Annualized Costs

Table 6-4 presents the results of the sales test based on posttax annualized costs by subcategory and small business status. Using posttax annualized compliance costs in the sales test accounts for the affect of tax shields that partially offset out-of-pocket costs for affected entities, however, it is assumed that facilities will not be able to pass through any costs to their customers.

As expected, the number of small entities experiencing impacts according to the sales test generally are less using posttax, rather than pretax, costs. Under the selected regulatory option, the posttax sales test results are similar to the pretax sales test results for indirect dischargers in the TT/CHEM&PETR subcategory: about half of small entities will experience costs exceeding 1 percent of revenues, and a third of small entities will experience costs exceeding 3 percent of revenues in the TT/CHEM&PETR subcategory. In both the RT/CHEM&PETR and TB/CHEM&PETR subcategories, half of small businesses will experience costs exceeding 1 percent of revenues, but none will experience costs exceeding 3 percent of revenues under the selected options.

Under the best-case scenario, facilities not only receive the tax shield created by expensing or depreciating a portion of compliance costs, but they are able to pass through a percentage of compliance costs to customers as well. Table 6-5 presents the posttax sales test results assuming positive cost pass

TABLE 6-3

ENTITIES WITH PRETAX ANNUALIZED COSTS EXCEEDING SPECIFIED PERCENTAGE OF REVENUES BY BUSINESS SIZE ASSUMING COST PASS THROUGH

				Threshold Exceedences					
Subcategory	Percent of Revenue	Business Size	Total in Class	Option 1	% of Class	Option 2	% of Class	Option 3	% of Class
TT/CHEM &PETR [1]	1%	Small	79	29	36.7%	43	54.4%		
		Other	243	97	39.9%	151	62.1%		
	3%	Small	79	7	8.9%	29	36.7%		
		Other	243	36	14.8%	65	26.7%		
RT/CHEM&PETR [2]	1%	Small	12	6	50.0%	9	75.0%	9	75.0%
		Other	29	0	0.0%	1	3.4%	2	6.9%
	3%	Small	12	0	0.0%	0	0.0%	6	50.0%
		Other	29	0	0.0%	0	0.0%	1	3.4%
TB/CHEM&PETR [3]	1%	Small	6	0	0.0%	3	50.0%		
		Other	4	1	25.0%	1	25.0%		
	3%	Small	6	0	0.0%	0	0.0%		
		Other	4	0	0.0%	1	25.0%		

Entity is small business-owned if parent business entity earned less than $5 million in revenues in 1994.
Results not included for TT/CHEM&PETR direct dischargers, RT/CHEM&PETR direct dischargers, or TB/CHEM&PETR indirect dischargers due to confidential business information disclosure issues.
Any impacts to the 4 nondisclosure facilities in these subcategories would not change EPA's assessment of the economic achievability of the rule.
[1] For 9 cost centers, the sales test is undefined.
[2] For 10 cost centers, the sales test is undefined.
[3] For 1 cost center, the sales test is undefined.

TABLE 6-4

ENTITIES WITH POSTTAX ANNUALIZED COSTS EXCEEDING SPECIFIED PERCENTAGE OF REVENUES BY BUSINESS SIZE ASSUMING ZERO COST PASS THROUGH

Subcategory	Percent of Revenue	Business Size	Total in Class	Threshold Exceedences					
				Option 1	% of Class	Option 2	% of Class	Option 3	% of Class
TT/CHEM &PETR [1]	1%	Small	79	29	36.7%	43	54.4%		
		Other	243	72	29.6%	145	59.7%		
	3%	Small	79	29	36.7%	36	45.6%		
		Other	243	36	14.8%	65	26.7%		
RT/CHEM&PETR [2]	1%	Small	12	6	50.0%	6	50.0%	9	75.0%
		Other	29	8	27.6%	12	41.4%	13	44.8%
	3%	Small	12	0	0.0%	0	0.0%	6	50.0%
		Other	29	0	0.0%	6	20.7%	13	44.8%
TB/CHEM&PETR [3]	1%	Small	6	3	50.0%	3	50.0%		
		Other	4	0	0.0%	1	25.0%		
	3%	Small	6	0	0.0%	0	0.0%		
		Other	4	0	0.0%	1	25.0%		

Entity is small business-owned if parent business entity earned less than $5 million in revenues in 1994.
Results not included for TT/CHEM&PETR direct dischargers, RT/CHEM&PETR direct dischargers, or TB/CHEM&PETR indirect dischargers due to confidential business information disclosure issues.
Any impacts to the 4 nondisclosure facilities in these subcategories would not change EPA's assessment of the economic achievability of the rule.
[1] For 9 cost centers, the sales test is undefined.
[2] For 10 cost centers, the sales test is undefined.
[3] For 1 cost center, the sales test is undefined.

TABLE 6-5

ENTITIES WITH POSTTAX ANNUALIZED COSTS EXCEEDING SPECIFIED PERCENTAGE OF REVENUES BY BUSINESS SIZE ASSUMING COST PASS THROUGH

				Threshold Exceedences					
Subcategory	Percent of Revenue	Business Size	Total in Class	Option 1	% of Class	Option 2	% of Class	Option 3	% of Class
TT/CHEM &PETR [1]	1%	Small	79	29	36.7%	43	54.4%		
		Other	243	65	26.7%	126	51.9%		
	3%	Small	79	0	0.0%	14	17.7%		
		Other	243	7	2.9%	43	17.7%		
RT/CHEM&PETR [2]	1%	Small	12	0	0.0%	6	50.0%	9	75.0%
		Other	29	0	0.0%	0	0.0%	1	3.4%
	3%	Small	12	0	0.0%	0	0.0%	0	0.0%
		Other	29	0	0.0%	0	0.0%	1	3.4%
TB/CHEM&PETR [3]	1%	Small	6	0	0.0%	3	50.0%		
		Other	4	0	0.0%	1	25.0%		
	3%	Small	6	0	0.0%	0	0.0%		
		Other	4	0	0.0%	1	25.0%		

Entity is small business-owned if parent business entity earned less than $5 million in revenues in 1994.
Results not included for TT/CHEM&PETR direct dischargers, RT/CHEM&PETR direct dischargers, or TB/CHEM&PETR indirect dischargers due to confidential business information disclosure issues.
Any impacts to the 4 nondisclosure facilities in these subcategories would not change EPA's assessment of the economic achievability of the rule.
[1] For 9 cost centers, the sales test is undefined.
[2] For 10 cost centers, the sales test is undefined.
[3] For 1 cost center, the sales test is undefined.

through. Under the selected options, zero small business owned facilities are expected to incur compliance costs exceeding 3 percent of revenues in any subcategory.

6.4.2 Closures, Employment Losses, and Revenue Losses

EPA examined projected closure impacts and the associated employment and revenue losses to evaluate whether they fall disproportionately on small entities. Under the selected regulatory options, no facilities, whether associated with small businesses or not, are expected to close. Impacts from closures, therefore, do not fall disproportionately on small businesses.

6.4.3 Financial Distress

Incremental financial distress occurs for small businesses only in the TT/CHEM&PETR subcategory under Option 2, which has not been selected for the final rule (seven small entities would have experienced financial distress under this option). Under the selected regulatory options, no small entities are expected to experience financial distress, although 14 large firms are expected to experience financial distress. Impacts in the form of financial distress, therefore, do not fall disproportionately on small business.

6.5 FINDINGS OF SIGNIFICANT IMPACT ON A SUBSTANTIAL NUMBER OF SMALL ENTITIES

EPA estimates that no small entities will close or experience financial distress as a result of the Final Rule. EPA has estimated that in its worst case sales test analysis (i.e., pretax cost, zero cost pass through), that only 41 small entities may experience compliance costs exceeding 1 percent of revenues. Thus, EPA certifies that the Final Rule will have no significant impact on a substantial number of small entities.

6.6 REFERENCES

Modern Bulk Transporter. 2000. Tank Truck Industry Struggles With Impact from Diesel Prices. Modern Bulk Transporter. Houston, TX. April:25.

U.S. EPA. 1998. Economic Analysis of Proposed Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA 821/B-98-012. Washington, DC: U.S. Environmental Protection Agency, Office of Water. May.

U.S. EPA. 2000a. Development Document for the Final Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA-821-R-00-012. Washington, DC: U.S. Environmental Protection Agency, Office of Water. June.

U.S. EPA. 2000b. Summary of Economic Impacts to TT/CHEM&PETR Directs, RT/CHEM&PETR Directs, and TB/CHEM&PETR Indirects. CBI Memorandum in the Rulemaking Record.

CHAPTER 7

BENEFITS METHODOLOGY

7.1 PROJECTED WATER QUALITY IMPACTS

EPA evaluated water quality impacts and associated risks/benefits of TEC discharges at various treatment levels by: (1) comparing projected instream concentrations with ambient water quality criteria,[1] (2) estimating the human health risks and benefits associated with the consumption of fish and drinking water from waterbodies impacted by the TEC industry, (3) estimating the ecological benefits associated with improved recreational fishing habitats on impacted waterbodies, and (4) estimating the economic productivity benefits based on reduced sewage sludge contamination at POTWs receiving the wastewater of TEC facilities. The Agency performed these analyses for a representative sample set of 40 indirect TT/CHEM&PETR facilities and 10 indirect RT/CHEM&PETR facilities. EPA extrapolated results to the national level based on the statistical methodology used for estimated costs, loads, and economic impacts. The methodologies used in this evaluation are described briefly below. Please see the *Environmental Assessment of the Final Effluent Guidelines for the Transportation Equipment Cleaning Industry* (U.S. EPA, 2000) for a full description of the methodology.

7.1.1 Comparison of Instream Concentrations with Ambient Water Quality Criteria

EPA quantified and compared current and proposed pollutant releases, and evaluated potential aquatic life and human health impacts resulting from current and proposed pollutant releases using stream modeling techniques. The Agency compared projected instream concentrations for each pollutant

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[1] In performing this analysis, EPA used guidance documents published by EPA that recommend numeric human health and aquatic life water quality criteria for numerous pollutants. States often consult these guidance documents when adopting water quality criteria as part of their water-quality standards. However, because those State-adopted criteria may vary, EPA used the nationwide criteria guidance as the most representative values. EPA also recognizes that currently there is no scientific consensus on the most appropriate approach for extrapolating the dose-response relationship to the low-dose associated with drinking water exposure for arsenic. EPA's National Center for Environmental Assessment and EPA's Office of Water sponsored an Expert Panel Workshop, May 21-22, 1997, to review and discuss the relevant scientific literature for evaluating the possible modes of action underlying the carcinogenic action of arsenic.

to EPA water quality criteria or, for pollutants for which no water quality criteria have been developed, to toxic effect levels (i.e., lowest reported or estimated toxic concentration). EPA also evaluated Inhibition of POTW operation and sludge contamination. The following two sections (i.e., Section 7.1.1.1 and Section 7.1.1.2) briefly describe the methodology used and the assumptions/caveats applied for evaluating the impact of indirect discharging facilities.

7.1.1.1 Indirect Discharging Facilities

Assessing the impacts of indirect discharging facilities is a two-stage process. First, Section (a) below describes the evaluation of water quality impacts. Next, Section (b) describes the evaluation of impacts on POTWs.

(a) Water Quality Impacts

EPA uses a stream dilution model to project receiving stream impacts resulting from releases by indirect discharging facilities. This model does not account for fate processes other than complete immediate mixing. For stream segments with multiple facilities, pollutant loadings are summed, if applicable, before concentrations are calculated. The Agency uses three receiving stream flow conditions (1Q10 low flow, 7Q10 low flow, and harmonic mean flow) for the current and proposed pretreatment options. For POTWs located on bays and estuaries, the Agency uses site-specific critical dilution factors (CDFs) or estuarine dissolved concentration potentials from the National Oceanic and Atmospheric Administration (NOAA) to predict pollutant concentrations..

EPA determines potential impacts on freshwater quality by comparing projected instream pollutant concentrations at reported POTW flows and at 1Q10 low, 7Q10 low, and harmonic mean receiving stream flows with EPA water quality criteria or toxic effect levels for the protection of aquatic life and human health. For estuaries, the Agency compares projected estuary pollutant concentrations, based on CDFs or DCPs, to EPA water quality criteria or toxic effect levels to determine impacts. EPA determines water quality criteria excursions by dividing the projected instream or estuary pollutant concentration by the EPA water quality criteria or toxic effect levels. (See Section 7.1.1.1 for discussion of streamflow conditions, application of CDFs or DCPs, assignment of exposure duration, and comparison with criteria or toxic effect levels.) A value greater than 1.0 indicates an excursion.

(b) Impacts on POTWs

EPA calculates the impacts on POTW operations in terms of inhibition of POTW processes (i.e., inhibition of microbial degradation) and contamination of POTW sludges. The Agency determines inhibition of POTW operations by dividing calculated POTW influent levels with chemical-specific inhibition threshold levels. A value greater than 1.0. indicates an excursion. Similarly, EPA evaluates contamination of sludge (thereby limiting its use for land application, etc.) by dividing projected pollutant concentrations in sludge by available EPA-developed criteria values for sludge. A value greater than 1.0 indicates an excursion. For facilities that discharge to the same POTW, their individual loadings are summed, if applicable, before the POTW influent and sludge concentrations are calculated.

7.1.1.2 Assumptions and Caveats

EPA uses a number of assumptions in this analysis. A few of the assumptions are listed below. The *Environmental Assessment of the Final Effluent Guidelines for the Transportation Equipment Cleaning Industry* (U.S. EPA, 2000) provides a complete list.

- Background concentrations of each pollutant, both in the receiving stream and in the POTW influent, are equal to zero; therefore, only the impacts of discharging facilities are evaluated.

- The pollutant load to the receiving stream is assumed to be continuous and is assumed to be representative of long-term facility operations. These assumptions may overestimate risks to human health and aquatic life, but may underestimate potential short-term effects.

- Pollutant fate processes, such as sediment adsorption, volatilization, and hydrolysis, are not considered. This may result in estimated instream concentrations that are environmentally conservative (higher).

- Sludge criteria levels are only available for seven pollutants--arsenic, cadmium, copper, lead, mercury, selenium, and zinc.

7.1.2 Estimation of Human Health Risks and Benefits

EPA evaluates the potential benefits to human health by estimating the risks (carcinogenic and noncarcinogenic hazard [systemic]) associated with reducing pollutant levels in fish tissue and drinking water from current to proposed treatment levels. The Agency monetizes reduction in carcinogenic risks, if applicable, using estimated willingness-to-pay values for avoiding premature mortality. The following three sections (i.e., Section 7.1.2.1 through Section 7.1.2.3) describe the methodology used and the assumptions/caveats applied to evaluate the human health risks and benefits from the consumption of fish tissue and drinking water derived from waterbodies impacted by direct and indirect discharging facilities.

7.1.2.1 Fish Tissue

To determine the potential benefits, in terms of reduced cancer cases, associated with reducing pollutant levels in fish tissue, EPA estimates lifetime average daily doses (LADDs) and individual risk levels for each pollutant discharged from a facility based on the instream pollutant concentrations calculated at current and proposed treatment levels in the site-specific stream dilution analysis (see Section 7.1.1.). Estimates include for sport anglers, subsistence anglers, and the general population.

The Agency then applies estimated individual pollutant risk levels to the potentially exposed populations of sport anglers, subsistence anglers, and the general population to estimate the potential number of excess annual cancer cases occurring over the life of the population. EPA then sums the number of excess cancer cases on a pollutant, facility, and overall industry basis. The Agency assumes that the number of reduced cancer cases is the difference between the estimated risks at current and proposed treatment levels.

EPA then estimates a monetary value of benefits to society from avoided cancer cases based on estimates of society's willingness-to-pay to avoid the risk of cancer-related premature mortality. Although it is not certain that all cancer cases will result in death, to develop a worst case estimate for this analysis, the Agency values avoided cancer cases on the basis of avoided *mortality*. To estimate a willingness-to-pay for avoiding certain or high probability mortality events, the Agency extrapolated from the results of studies on willingness-to-pay values associated with small changes in the probability of mortality to the value for a 100 percent probability event.[2] The resulting estimates of the value of a "statistical life saved" range from $2.2 to $11.7 million in 1994 dollars.

EPA estimates potential reductions in risks due to reproductive, developmental, or other chronic and subchronic toxic effects by comparing the estimated lifetime average daily dose and the oral reference dose (RfD) for a given chemical pollutant. The Agency then calculates a hazard index (i.e., sum of individual pollutant hazard quotients) for each facility or receiving stream. A hazard index greater than 1.0 indicates that toxic effects may occur in exposed populations. The Agency sums size of the subpopulations affected and compares them at the various treatment levels to assess benefits in terms of reduced systemic toxicity. While a monetary value of benefits to society associated with a reduction in the number of individuals exposed to pollutant levels likely to result in systemic health effects could not be estimated, any reduction in risk is expected to yield human health related benefits.

7.1.2.2 Drinking Water

The EPA determines potential benefits associated with reducing pollutant levels in drinking water in a similar manner. The Agency applies estimated individual pollutant risk levels greater than 10^{-6} (1E-6) to the population served downstream by any drinking water utilities within 50 miles from each discharge site to determine the number of excess annual cancer cases that may occur during the life of the population. EPA evaluates systemic toxicant effects by estimating the sizes of populations exposed to pollutants from a given facility, the sum of whose individual hazard quotients yields a hazard index (HI) greater than 1.0. The Agency estimates a monetary value of benefits to society from avoided cancer cases, if applicable, as described in Section 7.1.2.1.

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[2] These estimates, however, do not represent the willingness-to-pay to avoid the certainty of death.

7.1.2.3 Assumptions and Caveats

A number of assumptions are used in the human health risks and benefits analysis. For example, a few of the assumptions are listed below. The *Environmental Assessment of the Final Effluent Guidelines for the Transportation Equipment Cleaning Industry* (U.S. EPA, 2000) provides a complete list.

- Synergistic effects of multiple chemicals on aquatic ecosystems are not assessed; therefore, the total benefit of reducing toxics may be underestimated.

- The total number of persons who might consume recreationally caught fish and the number who rely upon fish on a subsistence basis in each State are estimated, in part, by assuming that these anglers regularly share their catch with family members. Therefore, the number of anglers in each State are multiplied by the average household size in each State. The remainder of the population of these States is assumed to be the "general population" consuming commercially caught fish.

- Ingestion rates of 6.5 grams per day for the general population, 30 grams per day (30 years) + 6.5 grams per day (40 years) for sport anglers, and 140 grams per day for subsistence anglers are used in the analysis of fish tissue (*Exposure Factors Handbook*, U.S. EPA, 1989a)

- Pollutant fate processes (e.g., sediment adsorption, volatilization, hydrolysis) are not considered in estimating the concentration in drinking water or fish; consequently, estimated concentrations are environmentally conservative (higher).

7.1.3 Estimation of Ecological Benefits

EPA evaluates the potential ecological benefits of the proposed regulation by estimating improvements in the recreational fishing habitats that are impacted by TEC wastewater discharges. The Agency first identifies stream segments for which the proposed regulation is expected to eliminate all occurrences of pollutant concentrations in excess of both aquatic life and human health ambient water quality criteria (AWQC) or toxic effect levels. (See Section 7.1.1.) The Agency assumes that the elimination of pollutant concentrations in excess of AWQC will result in significant improvements in aquatic habitats, which will in turn improve the quality and value of recreational fishing opportunities.

To estimate the gain in value of stream segments identified as showing improvements in aquatic habitats as a result of the proposed regulation, the Agency estimates the baseline recreational fishery value of the stream segments on the basis of estimated annual person-days of fishing per segment and estimated values per person-day of fishing. EPA calculates the annual person-days of fishing per segment using estimates of the affected (exposed) recreational fishing populations. (See Section 7.1.2.) The Agency multiplies the number of anglers by estimates of the average number of fishing days per angler in each State to estimate the total number of fishing days for each segment. The Agency then calculates the baseline value for each fishery 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. In this analysis, a range of median net benefit values for warm water and cold water fishing days, $29.47 and $37.32, respectively, in 1994 dollars is used. Summing over all benefitting stream segments provides a total baseline recreational fishing value of TEC facility stream segments that are expected to benefit by elimination of pollutant concentrations in excess of AWQC.

To estimate the increase in value resulting from elimination of pollutant concentrations in excess of AWQC, EPA multiplies the baseline value for benefitting stream segments by the incremental gain in value associated with achievement of the "contaminant-free" condition. The estimation of the monetary value to society of improved recreational fishing opportunities is currently based on the concept of a "contaminant-free fishery" as presented by Lyke (1993), whose research 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. Multiplying by these values yields a range of expected increase in value for the TEC facility stream segments expected to benefit by elimination of pollutant concentrations in excess of AWQC.

7.1.3.1 Nonuse Benefits

Individuals who never visit or otherwise use a natural resource may nevertheless be affected by changes in its status or quality. Empirical estimates indicate that such "nonuse value" can be substantial for some resources. Most studies find nonuse values to exceed use values. For example, based on a review 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. Because the 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.

7.1.3.2 Assumptions and Caveats

A number of assumptions are used in the ecological benefits analysis. For example, a few of the assumptions are listed below. The *Environmental Assessment of the Final Effluent Guidelines for the Transportation Equipment Cleaning Industry* (U.S. EPA, 2000) provides a complete list.

- Background concentrations of the TEC pollutants of concern in the receiving stream are not considered.
- The estimated benefit of improved recreational fishing opportunities is only a limited measure of the value to society of the improvements in aquatic habitats expected to result from the proposed regulation; increased assimilation capacity of the receiving stream, improvements in taste and odor, or improvements to other recreational activities, such as swimming and wildlife observation, are not addressed.

7.1.4 Estimation of Economic Productivity Benefits

EPA estimates the potential economic productivity benefits based on reduced sewage sludge contamination due to the proposed regulation. The treatment of wastewaters generated by TEC facilities produces a sludge that contains pollutants removed from the wastewaters. As required by law, POTWs must use environmentally sound practices in managing and disposing of this sludge. The Agency expects the proposed pretreatment levels to generate sewage sludges with reduced pollutant concentrations. As a result, the POTWs may be able to use or dispose of the sewage sludges with reduced pollutant concentrations at lower costs.

To determine the potential benefits, in terms of reduced sewage sludge disposal costs, EPA calculates sewage sludge pollutant concentrations at current and proposed pretreatment levels. (See

Section 7.1.1.2.) The Agency then compares pollutant concentrations to sewage sludge pollutant limits for surface disposal and land application (minimum ceiling limits and pollutant concentration limits). If, as a result of the proposed pretreatment, a POTW meets all pollutant limits for a sewage sludge use or disposal practice, EPA assumes that POTW will benefit from the increase in sewage sludge use or disposal options. The amount of the benefit deriving from changes in sewage sludge use or disposal practices depends on the sewage sludge use or disposal practices employed under current levels. This analysis assumes that POTWs choose the least expensive sewage sludge use or disposal practice for which their sewage sludge meets pollutant limits. The Agency assumes that POTWs with sewage sludge that qualifies for land application in the baseline dispose of their sewage sludge by land application; and that, likewise, POTWs with sewage sludge that meets surface disposal limits (but not land application ceiling or pollutant limits) dispose of their sewage sludge at surface disposal sites.

EPA calculates the economic benefit for POTWs receiving wastewater from a TEC facility by multiplying the cost differential between baseline and post-compliance sludge use or disposal practices by the quantity of sewage sludge that shifts into meeting land application (minimum ceiling limits and pollutant concentration limits) or surface disposal limits. Using these cost differentials, the Agency calculates reductions in sewage sludge use or disposal costs for each POTW.

7.1.4.1 Assumptions and Caveats

EPA makes a number of assumptions in the economic productivity analysis. For example, a few of the assumptions are listed below. The *Environmental Assessment of the Final Effluent Guidelines for the Transportation Equipment Cleaning Industry* (U.S. EPA, 2000) provides a complete list.

- 13.4 percent of the POTW sewage sludge generated in the United States is generated at POTWs that are located too far from agricultural land and surface disposal sites for these use or disposal practices to be economical. This percentage of sewage sludge is not associated with benefits from shifts to surface disposal or land application.

- Benefits expected from reduced record-keeping requirements and exemption from certain sewage sludge management practices are not estimated.

7.2 POLLUTANT FATE AND TOXICITY

Human and ecological exposure and risk from environmental releases of toxic chemicals depend largely on toxic potency, inter-media partitioning, and chemical persistence. These factors are dependant on chemical-specific properties relating to toxicological effects on living organisms, physical state, hydrophobicity/lipophilicity, and reactivity, as well as the mechanism and media of release and site-specific environmental conditions.

The methodology used in assessing the fate and toxicity of pollutants associated with TEC wastewaters comprises three steps: (1) identification of pollutants of concern; (2) compilation of physical-chemical and toxicity data; and (3) categorization assessment. These steps are described in detail below. This section also presents some of the major assumptions and limitations associated with this methodology.

7.2.1 Pollutants of Concern Identification

From 1994 through 1996, EPA conducted 20 sampling episodes to determine the presence or absence of priority, conventional, and nonconventional pollutants at TEC facilities located nationwide. EPA visited seven truck facilities, five rail facilities, seven barge facilities, and one closed-top hopper barge facility. There, EPA collected grab and composite samples of untreated process wastewater and treated final effluent. Most of these samples were analyzed for 477 analytes to identify pollutants at these facilities. Using these data, EPA applied two criteria to identify pollutants (i.e., pollutants of concern for each subcategory): (1) detected at least two times in the subcategory influent, and (2) average concentration of the pollutant in the influent greater than five times the detection limit.

In the TT/CHEM&PETR subcategory, EPA detected 98 pollutants (27 priority pollutants, three conventional pollutant parameters, and 68 nonconventional pollutants) in waste streams that met the selection criteria. In the RT/CHEM&PETR subcategory, EPA detected 85 pollutants (16 priority pollutants, three conventional pollutant parameters, and 66 nonconventional pollutants) in waste streams that met the selection criteria. The Agency identifies these pollutants as pollutants of concern and are evaluated to assess their potential fate and toxicity based on known characteristics of each chemical.

EPA models as many of these pollutants as possible in the environmental assessment, based on the availability of fate and toxicity information.

7.2.2 Compilation of Physical-Chemical and Toxicity Data

The chemical specific data needed to conduct the fate and toxicity evaluation for this study include aquatic life criteria or toxic effect data for native aquatic species, human health reference doses (RfDs) and cancer potency slope factors (SFs), EPA maximum contaminant levels (MCLs) for drinking water protection, Henry's Law constants, soil/sediment adsorption coefficients (K_{oc}), bioconcentration factors (BCFs) for native aquatic species, and aqueous aerobic biodegradation half-lives (BD).

Sources of the above data include EPA ambient water quality criteria documents and updates, EPA's Assessment Tools for the Evaluation of Risk (ASTER) and the associated AQUatic Information REtrieval System (AQUIRE) and Environmental Research Laboratory-Duluth fathead minnow data base, EPA's Integrated Risk Information System (IRIS), EPA's 1993-1995 Health Effects Assessment Summary Tables (HEAST), EPA's 1991-1996 Superfund Chemical Data Matrix (SCDM), EPA's 1989 Toxic Chemical Release Inventory Screening Guide, Syracuse Research Corporation's CHEMFATE data base, EPA and other government reports, scientific literature, and other primary and secondary data sources. To ensure that the examination is as comprehensive as possible, the Agency takes alternative measures to compile data for chemicals for which physical-chemical property and/or toxicity data are not presented in the sources listed above. To the extent possible, EPA estimates values for the chemicals using the quantitative structure-activity relationship (QSAR) model incorporated in ASTER, or for some physical-chemical properties, utilizing published linear regression correlation equations.

(a) Aquatic Life Data

EPA obtains ambient criteria or toxic effect concentration levels for the protection of aquatic life primarily from EPA ambient water quality criteria documents and EPA's ASTER. For several pollutants, EPA has published ambient water quality criteria for the protection of freshwater aquatic life from acute effects. The acute value represents a maximum allowable 1-hour average concentration of a pollutant at any time that protects aquatic life from lethality. For pollutants for which no acute water quality criteria have been developed by EPA, the Agency uses an acute value from published aquatic toxicity test data or an estimated acute value from the ASTER QSAR model. In selecting values from the literature, EPA prefers measured concentrations from flow-through studies under typical pH and temperature conditions. In addition, the test organism must be a North American resident species of fish or invertebrate.

BCF data are available from numerous data sources, including EPA ambient water quality criteria documents and EPA's ASTER. Because measured BCF values are not available for several chemicals, EPA uses methods to estimate this parameter based on the octanol/water partition coefficient or solubility of the chemical. Lyman et al. (1982) details such methods in detail. The Agency reviews multiple values, and selects the most conservative value (i.e., the highest BCF) from comparable candidate values.

(b) Human Health Data

Human health toxicity data include chemical-specific RfD for noncarcinogenic effects and potency SF for carcinogenic effects. EPA obtains RfDs and SFs primarily from EPA's IRIS, and secondarily from EPA's HEAST. The RfD is an estimate of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious noncarcinogenic health effects over a lifetime (U.S. EPA, 1989b). A chemical with a low RfD is more toxic than a chemical with a high RfD. Noncarcinogenic effects include systemic effects (e.g., reproductive, immunological, neurological, circulatory, or respiratory toxicity), organ-specific toxicity, developmental toxicity, mutagenesis, and lethality. EPA recommends a threshold level assessment approach for these systemic and other effects, because several protective mechanisms must be overcome prior to the appearance of an adverse noncarcinogenic effect. In contrast, EPA assumes that cancer growth can be initiated from a single cellular event and, therefore, should not be subject to a threshold level assessment approach. The SF is an upper bound estimate of the probability of cancer per unit intake of a chemical over a lifetime (U.S. EPA, 1989b). A chemical with a large SF has greater potential to cause cancer than a chemical with a small SF.

Other chemical designations related to potential adverse human health effects include EPA assignment of a concentration limit for protection of drinking water, and EPA designation as a priority pollutant. EPA establishes drinking water criteria and standards, such as the MCL, under authority of the Safe Drinking Water Act (SDWA). Current MCLs are available from IRIS. EPA has designated 126 chemicals and compounds as priority pollutants under the authority of the Clean Water Act (CWA).

(c) Physical-Chemical Property Data

Three measures of physical-chemical properties are used to evaluate environmental fate: Henry's Law constant (HLC), an organic carbon-water partition coefficient (K_{oc}), and aqueous aerobic biodegradation half-life (BD).

HLC is the ratio of vapor pressure to solubility and is indicative of the propensity of a chemical to volatilize from surface water (Lyman et al., 1982). The larger the HLC, the more likely the chemical will volatilize. Most HLCs are obtained from EPA's Office of Toxic Substances' (OTS) 1989 Toxic Chemical Release Inventory Screening Guide (U.S. EPA, 1989c), the Office of Solid Waste's (OSW) Superfund Chemical Data Matrix (U.S. EPA, 1994a), or the quantitative structure-activity relationship (QSAR) system (U.S. EPA, 1993a), maintained by EPA's Environmental Research Laboratory (ERL) in Duluth, Minnesota.

K_{oc} is indicative of the propensity of an organic compound to adsorb to soil or sediment particles and, therefore, partition to such media. The larger the K_{oc}, the more likely the chemical will adsorb to solid material. Most K_{oc}s are obtained from Syracuse Research Corporation's CHEMFATE data base and EPA's 1989 Toxic Chemical Release Inventory Screening Guide.

BD is an empirically-derived time period when half of the chemical amount in water is degraded by microbial action in the presence of oxygen. BD is indicative of the environmental persistence of a chemical released into the water column. Most BDs are obtained from Howard et al. (1991) and ERL-Duluth's QSAR.

7.2.3 Categorization Assessment

The objective of this generalized evaluation of fate and toxicity potential is to place chemicals into groups with qualitative descriptors of potential environmental behavior and impact. These groups are based on categorization schemes derived for:

- # Acute aquatic toxicity (high, moderate, or slight).
- # Volatility from water (high, moderate, slight, or nonvolatile).
- # Adsorption to soil/sediment (high, moderate, slight, or nonadsorptive).
- # Bioaccumulation potential (high, moderate, slight, or nonbioaccumulative).
- # Biodegradation potential (fast, moderate, slow or resistant).

Using appropriate key parameters, and where sufficient data exist, these categorization schemes identify the relative aquatic and human toxicity and bioaccumulation potential for each chemical associated with TEC wastewater. In addition, the potential to partition to various media (air, sediment/sludge, or water) and to persist in the environment is identified for each chemical. These schemes are intended for screening purposes only and do not take the place of detailed pollutant assessments analyzing all fate and transport mechanisms.

This evaluation also identifies chemicals that: (1) are known, probable, or possible human carcinogens; (2) are systemic human health toxicants; (3) have EPA human health drinking water standards; and (4) are designated as priority pollutants by EPA. The results of this analysis can provide a qualitative indication of potential risk posed by the release of these chemicals. Actual risk depends on the magnitude, frequency, and duration of pollutant loading; site-specific environmental conditions; proximity and number of human and ecological receptors; and relevant exposure pathways. The following discussion outlines the categorization schemes.

(a) Acute Aquatic Toxicity

The key parameter used to evaluate acute aquatic toxicity is the acute aquatic life criteria/LC_{50} or other benchmark (AT) (Fg/L). Using acute criteria or lowest reported acute test results (generally 96-

hour and 48-hour durations for fish and invertebrates, respectively), EPA groups chemicals according to their relative short-term effects on aquatic life. EPA applies a scheme, used as a rule-of-thumb guidance by EPA's OPPT for Premanufacture Notice (PMN) evaluations, to indicate chemicals that could potentially cause lethality to aquatic life downstream of discharges.

(b) Volatility from Water

The key parameter for ranking volatility from water is Henry's Law constant (HLC) (atm-m^3/mol). HLC is the measured or calculated ratio between vapor pressure and solubility at ambient conditions. This parameter is used to indicate the potential for organic substances to partition to air in a two-phase (air and water) system. A chemical's potential to volatilize from surface water can be inferred from HLC. EPA uses a scheme adopted from Lyman et al. (1982) to indicate chemical potential to volatilize from process wastewater and surface water, thereby reducing the threat to aquatic life and human health via contaminated fish consumption and drinking water, yet potentially causing risk to exposed populations via inhalation.

(c) Adsorption to Soil/Sediments

The key parameter for evaluating pollutant adsorption to soil and sediments is the soil/sediment adsorption coefficient (K_{oc}). K_{oc} is a chemical-specific adsorption parameter for organic substances that is largely independent of the properties of soil or sediment and can be used as a relative indicator of adsorption to such media. K_{oc} is highly inversely correlated with solubility, well correlated with octanol-water partition coefficient, and fairly well correlated with BCF. EPA uses a ranking scheme based on orders of magnitude of K_{oc} values to evaluate substances that may partition to solids and potentially contaminate sediment underlying surface water or land receiving sewage sludge applications. Although a high K_{oc} value indicates that a chemical is more likely to partition to sediment, it also indicates that a chemical may be less bioavailable.

(d) Bioaccumulation Potential

The key parameter for ranking bioaccumulation potential is the Bioconcentration Factor (BCF). BCF is the measured or calculated ratio between the equilibrium chemical concentration in an organism (wet weight) and the mean chemical concentration in water. It is a good indicator of potential to accumulate in aquatic biota through uptake across an external surface membrane. EPA applies a scheme based on orders of magnitude of the BCF to identify chemicals that may be present in fish or shellfish tissues at higher levels than in surrounding water. These chemicals may accumulate in the food chain and increase exposure to higher trophic level populations, including people consuming their sport catch or commercial seafood.

(e) Biodegradation Potential

The key parameter for evaluating biodegradation potential is the Aqueous Aerobic Biodegradation Half-life (BD) (days). Biodegradation, photolysis, and hydrolysis are three potential mechanisms of organic chemical transformation in the environment. A BD is selected to represent chemical persistence because of its importance and the abundance of measured or estimated data relative to other transformation mechanisms. EPA uses a categorization scheme based on classification ranges given in a recent compilation of environmental fate data (Howard et al., 1991) for this parameter. The scheme gives an indication of chemicals that are likely to biodegrade in surface water, and therefore, not persist in the environment. However, biodegradation products can be less toxic, equally as toxic, or even more toxic than the parent compound.

7.2.4 Assumptions and Limitations

The major assumptions and limitations associated with the data compilation and categorization schemes are summarized in the following two sections.

(a) Data Compilation

- # If data are readily available from electronic data bases, other primary and secondary sources are not searched.
- # Much of the data are estimated and, therefore, can have a high degree of associated uncertainty.
- # For some chemicals, neither measured nor estimated data are available for key categorization parameters. In addition, chemicals identified for this study do not represent a complete set of wastewater constituents. As a result, this study does not completely assess TEC wastewater.

(b) Categorization Schemes

- # Receiving waterbody characteristics, pollutant loading amounts, exposed populations, and potential exposure routes are not considered.
- # Placement into groups is based on arbitrary order of magnitude data breaks for several categorization schemes. Combined with data uncertainty, this may lead to an overstatement or understatement of the characteristics of a chemical.
- # Data derived from laboratory tests may not accurately reflect conditions in the field.
- # Available aquatic toxicity and bioconcentration test data may not represent the most sensitive species.
- # The biodegradation potential may not be a good indicator of persistence for organic chemicals that rapidly photoxidize or hydrolyze, since these degradation mechanisms are not considered.

7.3 DOCUMENTED ENVIRONMENTAL IMPACTS

State and Regional environmental agencies are contacted, and State 304(l) Short Lists, State Fishing Advisories, and published literature are reviewed for evidence of documented environmental impacts on aquatic life, human health, POTW operations, and the quality of receiving water due to discharges of pollutants from TEC facilities. Reported impacts are compiled and summarized by study site and facility.

7.4 REFERENCES

Bergstrom, J.C., 1993. Benefits and Cost Transfer in Natural Resource Planning. Sixth Interim Report. Athens, GA: University of Georgia, Department of Agricultural and Applied Economics.

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.

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.

Harpman, D.A., M.P. Welsh, and R.C. Bishop, 1994. "Nonuse economic value: Emerging policy analysis tool." Rivers. Vol. 4, No. 4.

Howard, P.H. Editor. 1991. Handbook of Environmental Degradation Rates. Chelsea, MI: Lewis Publishers, Inc.

Knight-Ridder Information. 1996. Knight-Ridder Information Database - DIALOG, Knight-Ridder Information, Inc., Palo Alto, CA.

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.

Lyman, W.J.; W.F. Reehl; and D.H. Rosenblatt. 1982. Handbook of Chemical Property Estimation Methods - Environmental Behavior of Organic Compounds. New York, NY: McGraw-Hill Book Company.

Metcalf & Eddy, Inc. 1972. Wastewater Engineering. New York, NY: McGraw-Hill Book Company.

National Oceanic and Atmospheric Administration and U.S. Environmental Protection Agency. 1989a. Strategic Assessment of Near Coastal Waters. "Susceptibility of East Coast Estuaries to Nutrient Discharges: Albemarle/Pamlico Sound to Biscayne Bay." Rockville, MD: Strategic Assessment Branch. NOAA.

National Oceanic and Atmospheric Administration and U.S. Environmental Protection Agency. 1989b. Strategic Assessment of Near Coastal Waters. "Susceptibility of East Coast Estuaries to Nutrient Discharges: Passamaquoddy Bay to Chesapeake Bay." Rockville, MD: Strategic Assessment Branch. NOAA.

National Oceanic and Atmospheric Administration and U.S. Environmental Protection Agency. 1989c. Strategic Assessment of Near Coastal Waters. "Susceptibility and Status of Gulf of Mexico Estuaries to Nutrient Discharges." Rockville, MD: Strategic Assessment Branch. NOAA.

National Oceanic and Atmospheric Administration and U.S. Environmental Protection Agency. 1991. Strategic Assessment of Near Coastal Waters. "Susceptibility and Status of West Coast Estuaries to Nutrient Discharges: San Diego Bay to Puget Sound." Rockville, MD: Strategic Assessment Branch. NOAA.

U.S. Bureau of the Census. 1995. Statistical Abstract of the United States: 1995. Washington, DC: U.S. Bureau of the Census.

U.S. Environmental Protection Agency. 1980. Ambient Water Quality Criteria Documents. Washington, DC: U.S. EPA, Office of Water. EPA 440/5-80 Series. [Also refers to any updated criteria documents (EPA 440/5-85 and EPA 440/5-87 Series)].

U.S. Environmental Protection Agency. 1982. Fate of Priority Pollutants in Publicly-Owned Treatment Works "50 POTW Study." Washington, DC: U.S. EPA, Office of Water. EPA 440/1-2/303.

U.S. Environmental Protection Agency. 1986. Report to Congress on the Discharge of Hazardous Wastes to Publicly-Owned Treatment Works (Domestic Sewage Study). Washington, DC: U.S. EPA, Office of Water Regulations and Standards.

U.S. Environmental Protection Agency. 1987. Guidance Manual for Preventing Interference at POTWs. Washington, DC: U.S. EPA.

U.S. Environmental Protection Agency. 1989a. Exposure Factors Handbook. Washington, DC: U.S. EPA, Office of Health and Environmental Assessment. EPA/600/8-89/043.

U.S. Environmental Protection Agency. 1989b. Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual (Part A). Washington, DC: U.S. EPA, Office of Emergency and Remedial Response. EPA/540/1-89/002. Available from NTIS, Springfield, VA. PB-90-155581.

U.S. Environmental Protection Agency. 1989c. Toxic Chemical Release Inventory - Risk Screening Guide. Washington, DC: U.S. EPA, Office of Pesticides and Toxic Substances. EPA/560/2-89-002.

U.S. Environmental Protection Agency. 1990a. CERCLA Site Discharges to POTWs: Guidance Manual. Washington, DC: U.S. EPA, Office of Emergency and Remedial Response. EPA/540/G-90/005.

U.S. Environmental Protection Agency. 1990b. National Water Quality Inventory - Report to Congress. Washington, DC: U.S. EPA, Office of Water.

U.S. Environmental Protection Agency. 1991a. Technical Support Document for Water Quality-Based Toxics Control. Washington, DC: U.S. EPA, Office of Water. EPA/505/2-90-001. Available from NTIS, Springfield, VA. PB91-127415.

U.S. Environmental Protection Agency. 1991b. National 304(l) Short List Database. Compiled from Office of Water Files dated April/May 1991. Washington, DC: U.S. EPA, Office of Water.

U.S. Environmental Protection Agency. 1992a. Mixing Zone Dilution Factors for New Chemical Exposure Assessments, Draft Report, October 1992. Washington, DC: U.S. EPA, Contract No. 68-D9-0166. Task No. 3-35.

U.S. Environmental Protection Agency. 1992b. Needs Survey. Washington, DC: U.S. EPA, Office of Wastewater Enforcement and Compliance.

U.S. Environmental Protection Agency. 1993a. QSAR. Duluth, MN: U.S. EPA, Environmental Research Laboratory.

U.S. Environmental Protection Agency. 1993b. Environmental Assessment of the Pesticide Manufacturing Industry. Washington, DC: U.S. EPA, Office of Water.

U.S. Environmental Protection Agency. 1993-1996. Permit Compliance System. Washington, DC: U.S. EPA, Office of Wastewater Enforcement and Compliance.

U.S. Environmental Protection Agency. 1994a. Superfund Chemical Data Matrix. Washington, DC: U.S. EPA, Office of Solid Waste.

U.S. Environmental Protection Agency. 1994b. 1994 Detailed Questionnaire for the Transportation Equipment Cleaning Industry. Washington, DC: U.S. EPA, Office of Water, Engineering and Analysis Division.

U.S. Environmental Protection Agency. 1994-1996a. Industrial Facilities Discharge (IFD) File. Washington, DC: U.S. EPA, Office of Wetlands, Oceans, and Watersheds.

U.S. Environmental Protection Agency. 1994-1996b. Gage File. Washington, DC: U.S. EPA, Office of Wetlands, Oceans and Watersheds.

U.S. Environmental Protection Agency. 1995a. National Risk Management Research Laboratory Data Base. Cincinnati, Ohio: U.S. EPA, Office of Research and Development.

U.S. Environmental Protection Agency. 1995b. Environmental Assessment of the Proposed Effluent Guidelines for the Metal Products and Machinery Industry (Phase I). Washington, DC: U.S. EPA, Office of Water.

U.S. Environmental Protection Agency. 1995c. Environmental Assessment of Proposed Effluent Guidelines for the Centralized Waste Treatment Industry. Washington, DC: U.S. EPA, Office of Water. EPA 821-R-95-003.

U.S. Environmental Protection Agency. 1995d. Standards for the Use and Disposal of Sewage Sludge: Final Rules. 40 CFR Part 257 et seq. Washington, DC: Federal Register. October 1995.

U.S. Environmental Protection Agency. 1995e. Regulatory Impact Analysis of Proposed Effluent Limitations Guidelines and Standards for the Metal Products and Machinery Industry (Phase I). Washington, DC: U.S. EPA, Office of Water. EPA/821-R-95-023.

U.S. Environmental Protection Agency. 1995f. National Listing of Fish and Wildlife Consumption Advisories. Washington, DC: U.S. EPA, Office of Water.

U.S. Environmental Protection Agency. 1996a. PATHSCAN. Washington, DC: U.S. EPA, Office of Water WQAB Interactive Procedure.

U.S. Environmental Protection Agency. 1996b. Drinking Water Supply (DWS) File. Washington, DC: U.S. EPA, Office of Wetlands, Oceans and Watersheds.

U.S. Environmental Protection Agency. 1996c. Federal Reporting Data System (FRDS). Washington, DC: U.S. EPA, Office of Ground Water and Drinking Water.

U.S. Environmental Protection Agency. 1997. TEC Pollutant Loading Files. Washington, DC: U.S. EPA, Office of Water, Engineering and Analysis Division.

U.S. Environmental Protection Agency. 2000. Environmental Assessment of the Final Effluent Guidelines for the Transportation Equipment Cleaning (TEC) Industry. U.S. Environmental Protection Agency, Office of Water. June.

U.S. Department of the Interior Fish and Wildlife Service. 1991. National Survey of Fishing, Hunting and Wildlife Associated Recreation.

Versar, Inc. 1992. Upgrade of Flow Statistics Used to Estimate Surface Water Chemical Concentrations for Aquatic and Human Exposure Assessment. Report prepared by Versar Inc. for the U.S. EPA, Office of Pollution Prevention and Toxics.

Violette, D., and L. Chestnut. 1986. Valuing Risks: New Information on the Willingness to Pay for Changes in Fatal Risks. Report to the U.S. EPA, Washington, DC. Contract No. 68-01-7047.

Viscusi, K. 1992. Fatal Tradeoffs: Public & Private Responsibilities for Risk. New York, NY: Oxford University Press.

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.

CHAPTER 8

ENVIRONMENTAL ASSESSMENT AND BENEFITS ANALYSIS

8.1 OVERVIEW

The environmental assessment quantifies the water quality-related benefits for TEC facilities based on site-specific analyses of current conditions and the conditions that would be achieved by process changes under proposed BAT (Best Available Technology) and PSES (Pretreatment Standards for Existing Sources) controls. For the Transportation and Equipment Cleaning Industry, the Agency estimated in-stream pollutant concentrations for 112 priority and nonconventional pollutants from two subcategories (TT/CHEM&PETR and RT/CHEM&PETR) of indirect discharges using stream dilution modeling. EPA analyzed discharges from representative sample sets of 40 indirect TT/CHEM&PETR facilities and 10 indirect RT/CHEM&PETR. The Agency then extrapolated results to the national level, based on the statistical methodology used for estimated costs, loads, and economic impacts from discharges by 286 TT/CHEM&PETR facilities and 30 RT/CHEM&PETR facilities.

This chapter presents the results of the environmental assessment and benefits analysis. The full analysis can be found in the *Environmental Assessment of the Final Effluent Guidelines for the Transportation Equipment Cleaning (TEC) Industry* (U.S. EPA, 2000). Section 8.2 presents the results of the water quality impacts analysis. Section 8.3 discusses human health risks and benefits; this addresses the potential reduction of carcinogenic risk and noncarcinogenic hazard (systemic) from consuming contaminated fish or drinking water. Section 8.4 describes ecological benefits, specifically recreational and nonuse benefits. Section 8.5 provides economic productivity benefits based on potential inhibition of operations at publicly owned treatment works (POTW) and sewage sludge contamination (thereby limiting its use for land application). Section 8.6 presents pollutant fate and toxicity information, and Section 8.7 discusses documented impacts.

8.2 WATER QUALITY IMPACTS

EPA evaluated the water quality impacts of indirect TEC discharges at current and proposed PSES treatment levels by comparing projected in-stream pollutant concentrations with aquatic life and human health AWQC using stream modeling techniques. Human health criteria or toxic effect levels are based on a target risk of 10^{-6} for carcinogens. They are developed in two ways: (1) for consumption of both water **and** organisms, and (2) for consumption of organisms **only**. The following sections summarize potential human health and aquatic life impacts on POTW operations and their receiving stream water quality for indirect TT/CHEM&PETR, and RT/CHEM&PETR dischargers.

8.2.1 Truck Chemical and Petroleum Facilities

8.2.1.1 Sample Set

EPA performed water quality modeling for a representative sample set of 40 TT/CHEM&PETR facilities, discharging 84 pollutants to 34 POTWs with outfalls on 34 receiving streams.

Human Health Criteria: The Agency projects that in-stream concentrations of no pollutants will exceed human health criteria or toxic effect levels in any of the 34 receiving streams at current discharge levels. This result applies to both (1) the criteria developed for water **and** organisms consumption and (2) the criteria developed for organisms consumption **only**.

Aquatic Life Criteria: EPA also projects that in-stream pollutant concentrations will exceed chronic aquatic life criteria or toxic effect levels for one pollutant in one of the 34 receiving streams at current discharge levels. The TEC effluent guidelines eliminate this projected excursion. No excursions of acute aquatic life criteria or toxic effect levels are projected.

8.2.1.2 National Extrapolation

The Agency extrapolated modeling results of the sample set to 286 TT/CHEM&PETR facilities discharging the same 84 pollutants to 255 POTWs located on 255 receiving streams.

Human Health Criteria: EPA projects that extrapolated in-stream pollutant concentrations of no pollutants will exceed human health criteria or toxic effect levels in any of the 255 receiving streams at current discharge levels. This result applies to both (1) the criteria developed for water **and** organisms consumption and (2) the criteria developed for organisms consumption **only**.

Aquatic Life Criteria: The Agency's extrapolated in-stream concentrations indicate that one pollutant will exceed chronic aquatic life criteria or toxic effect levels in seven of the 255 receiving streams at current discharge levels. The TEC effluent guidelines eliminate these excursions.

8.2.2 Rail Chemical and Petroleum Facilities

8.2.2.1 Sample Set

EPA performed water quality modeling for a representative sample set of 10 indirect RT/CHEM&PETR facilities that discharge 74 pollutants to nine POTWs with outfalls on nine receiving streams.

Human Health Criteria: At current discharge levels, the Agency projects that in-stream concentrations of two pollutants will exceed human health criteria or toxic effect levels developed for water **and** organisms consumption in four of the nine receiving streams. With the TEC effluent guidelines, EPA projects that one pollutant will exceed these criteria in the four receiving streams. EPA projects excursions of human health criteria or toxic effect levels developed for organisms consumption **only** for one pollutant in one of the nine receiving streams. The TEC effluent guidelines will eliminate this excursion.

Aquatic Life Criteria: EPA projects no pollutant concentrations will exceed either acute or chronic aquatic life criteria or toxic effect levels in the nine receiving streams at current discharge levels.

8.2.2.2 National Extrapolation

The Agency extrapolated modeling results of the sample set to 30 RT/CHEM&PETR facilities discharging the same 74 pollutants to 28 POTWs with outfalls on 28 receiving streams.

Human Health Criteria: EPA projects that, at current discharge levels, in-stream concentrations of two pollutants will exceed human health criteria or toxic effect levels developed for water **and** organisms consumption in 13 of the 28 receiving streams. With the TEC effluent guidelines, the Agency projects that one pollutant will still exceed these criteria in the 13 receiving streams. EPA also projects excursions of human health criteria or toxic effect levels developed for organisms consumption **only** for one pollutant in six of the 28 receiving streams. The TEC effluent guidelines will eliminate this excursion.

Aquatic Life Criteria: Since no excursions are projected for the sample set, results are not extrapolated to the national level.

8.3 HUMAN HEALTH RISKS AND BENEFITS

The results of this analysis indicate the potential benefits to human health by estimating the risks (carcinogenic and systemic) associated with current and reduced pollutant levels in fish tissue and drinking water. The Agency used modeled pollutant concentrations in fish and drinking water to estimate cancer risk (based on a target risk of 10^{-6} for carcinogens) and systemic hazards among the general population, sport anglers and their families, and subsistence anglers and their families.

8.3.1 Truck Chemical and Petroleum Facilities

8.3.1.1 Sample Set

EPA evaluated the potential impact of the discharges from the 40 indirect TT/CHEM&PETR facilities in terms of human health risks and benefits.

Potential Reduction of Carcinogenic Risk: Projections for the sample set show that the TEC effluent guidelines will reduce total excess annual cancer cases by 1.2E-4 cancer cases. The monetary value of benefits to society from these avoided cancer cases is $300-$1,500 (1994 dollars). EPA projects no excess annual cancer cases from the consumption of contaminated drinking water for indirect wastewater discharges.

Potential Reduction of Noncarcinogenic (Systemic) Hazard: The Agency projects no systemic toxicant effects are projected from exposure to contaminated fish or drinking water, based on the estimated hazard calculated for each receiving stream for both direct and indirect wastewater discharges.

8.3.1.2 National Extrapolation

EPA extrapolated the potential impact to the national level for discharges from the 286 indirect TT/CHEM&PETR facilities in terms of human health risks and benefits.

Potential Reduction of Carcinogenic Risk: The extrapolation indicates that the reduction of total excess annual cancer cases due to the TEC is 1.0E-3 cancer cases. The monetary value of benefits to society from these avoided cancer cases is $2,200-$12,000 (1994 dollars). EPA projects no excess annual cancer cases from the consumption of contaminated drinking water for indirect wastewater discharges.

Potential Reduction of Noncarcinogenic (Systemic) Hazard: The Agency projects no systemic toxicant effects are projected from exposure to contaminated fish or drinking water, based on the estimated hazard calculated for each receiving stream for both direct and indirect wastewater discharges.

8.3.2 Rail Chemical and Petroleum Facilities

8.3.2.1 Sample Set

The Agency evaluated the potential impact of discharges from the 10 RT/CHEM&PETR facilities in terms of human health risks and benefits.

Potential Reduction of Carcinogenic Risk: Projections for the sample set show that the TEC effluent guidelines will reduce total excess annual cancer cases by 4.0E-3 cancer cases. The monetary value of benefits to society from these avoided cancer cases is $9,000-$47,000 (1994 dollars). Total excess annual cancer cases are not projected from the consumption of contaminated drinking water for indirect wastewater discharges.

Potential Reduction of Noncarcinogenic (Systemic) Hazard: The Agency projects no systemic toxicant effects are projected from exposure to contaminated fish or drinking water, based on the estimated hazard calculated for each receiving stream for both direct and indirect wastewater discharges.

8.3.2.2 National Extrapolation

The Agency extrapolated modeling results of the sample set to discharges from 30 RT/CHEM&PETR facilities in terms of human health risks and benefits.

Potential Reduction of Carcinogenic Risk: The extrapolation indicates that the TEC effluent guideline will reduce total excess annual cancer cases by 2.2E-2 cancer cases. The monetary value of benefits to society from these avoided cancer cases is $48,000-$257,000 (1994 dollars). EPA projects no excess annual cancer cases from the consumption of contaminated drinking water for indirect wastewater discharges.

Potential Reduction of Noncarcinogenic (Systemic) Hazard: Since no systemic toxicant effects are projected in the sample set, none are projected at the national level.

8.4 ECOLOGICAL BENEFITS

The Agency projected potential ecological benefits of the proposed regulation, based on improvements in recreational fishing habitats. In addition to recreational uses, individuals who never visit or otherwise use a natural resource might nevertheless be affected by changes in its status or quality. For this analysis, EPA estimated that nonuse benefits compose one-half of recreational fishing benefits. These nonuse benefits may be significantly underestimated. The following sections present the results of the analysis, including non-monetizable benefits.

8.4.1 Truck Chemical and Petroleum Discharges

8.4.1.1 Sample Set

EPA evaluated the potential impact of discharges from the 40 indirect TT/CHEM&PETR facilities in terms of recreational and nonuse benefits.

Recreational Benefits: Modeling results indicate that concentrations in excess of AWQC will be eliminated at one receiving streams as a result of the TEC effluent guidelines. The resulting estimate of the increase in value of recreational fishing to anglers on the improved receiving streams is $124,000 to $444,000 (1994 dollars).

Nonuse Benefits: The resulting estimate of the nonuse (intrinsic) benefits to the general public, as a result of the same improvements in water quality, ranges from at least $62,000 to $222,000 (1994 dollars).

8.4.1.2 National Extrapolation

EPA extrapolated the potential impact to the national level for the discharges from 286 indirect TT/CHEM&PETR facilities in terms of recreational and nonuse benefits.

Recreational Benefits: Based on extrapolated data to the national level, modeling results indicate that the proposed regulation will completely eliminate in-stream concentrations in excess of AWQC at seven receiving streams. The resulting estimate of the increase in value of recreational fishing to anglers ranges from $891,000 to $3,183,000 (1994 dollars).

Nonuse Benefits: The estimate of the nonuse (intrinsic) benefits to the general public, as a result of the same improvements in water quality, ranges from at least $445,500 to $1,591,500 (1994 dollars).

8.4.2 Rail Chemical and Petroleum Discharges

8.4.2.1 Sample Set

The Agency evaluated the potential impact of discharges from the 10 RT/CHEM&PETR facilities in terms of recreational and nonuse benefits.

Recreational Benefits: Modeling results indicate that the proposed regulation will not completely eliminate in-stream concentrations in excess of aquatic life and human health AWQC in any stream receiving wastewater discharges from these facilities.

Nonuse Benefits: Without recreational benefits, nonuse benefits cannot be estimated.

8.4.2.2 National Extrapolation

The Agency extrapolated modeling results of the sample set to discharges from 30 RT/CHEM&PETR facilities in terms of recreational and nonuse benefits.

Recreational Benefits: Since no recreational benefits are projected for the sample set, results are not extrapolated to the national level.

Nonuse Benefits: Since no nonuse benefits are projected for the sample set, results are not extrapolated to the national level.

8.4.3 Non-monetizable Benefits

The estimated benefit of improved recreational fishery opportunities is only a limited measure of the value to society of the improvements in aquatic habitats expected to result from the proposed regulation. Additional benefits, which could not be quantified in this assessment, include increased assimilation capacity of the receiving stream, protection of terrestrial wildlife and birds that consume aquatic organisms, maintenance of an aesthetically pleasing environment, and improvements to other recreational activities such as swimming, water skiing, boating, and wildlife observation. Such activities contribute to the support of local and State economies.

8.5 ECONOMIC PRODUCTIVITY BENEFITS

The Agency evaluated potential economic productivity benefits, based on reduced sewage sludge contamination and sewage sludge disposal costs, at POTWs receiving the wastewater discharges from indirect TEC facilities. EPA estimated inhibition of POTW operations by comparing modeled POTW influent concentrations to available inhibition levels, and estimated contamination of sewage by comparing projected pollutant concentrations in sewage sludge to available EPA regulatory standards. The Agency estimated economic productivity benefits on the basis of the incremental quantity of sludge that, as a result of reduced pollutant discharges to POTWs, meets criteria for the generally less expensive disposal method, namely land application and surface disposal.

8.5.1 Truck Chemical and Petroleum Discharges

8.5.1.1 Sample Set

EPA evaluated the potential impact of the 40 indirect TT/CHEM&PETR facilities on the 34 POTWs receiving their discharges in terms of inhibition of POTW operation and contamination of sludge.

POTW Inhibition: Modeling results project no inhibition problems.

Sludge Contamination: Modeling results indicate no sludge contamination problems.

8.5.1.2 National Extrapolation

EPA extrapolated the potential impact to the national level for the 286 indirect TT/CHEM&PETR facilities on the 255 POTWs receiving their discharges in terms of inhibition of POTW operation and contamination of sludge.

POTW Inhibition: Since results indicate no inhibition impacts at POTWs for the sample set, results are not extrapolated to the national level.

Sludge Contamination: Since results project no impacts at POTWs for the sample set, results are not extrapolated to the national level.

8.5.2 Rail Chemical and Petroleum Discharges

8.5.2.1 Sample Set

The Agency evaluated the potential impact of the 10 RT/CHEM&PETR facilities, which discharge to 9 POTWs, in terms of inhibition of POTW operation and contamination of sludge.

POTW Inhibition: At current discharge levels, EPA projects inhibition problems from two pollutants at four of the nine POTWs receiving wastewater discharges. The TEC effluent guidelines eliminates inhibition problems at three of these POTWs. Monetary values for the reduction of inhibition problems cannot currently be estimated.

Sludge Contamination: The Agency projects no sludge contamination problems.

8.5.2.2 National Extrapolation

The Agency extrapolated modeling results of the sample set to 30 RT/CHEM&PETR facilities discharging the same 74 pollutants to 28 POTWs in terms of POTW inhibition and sludge contamination.

POTW Inhibition: Extrapolation to the national level indicates inhibition problems at 13 of the 28 of the POTWs receiving wastewater discharges at current discharge levels. The TEC effluent guidelines will reduce projected problems to six of the 28 POTWs. Monetary values for the reduction of inhibition problems cannot currently be estimated.

Sludge Contamination: Since no impacts at POTWs are projected for the sample set, results are not extrapolated to the national level.

8.6 POLLUTANT FATE AND TOXICITY

Human exposure, ecological exposure, and risks from environmental releases of toxic chemicals depend largely on toxic potency, inter-media partitioning, and chemical persistence. These factors are dependent on chemical-specific properties relating to physical state, hydrophobicity/lipophilicity, reactivity, and toxicological effects on living organisms. For example, volatile pollutants potentially cause risk to exposed populations via inhalation, and pollutants with high potential to bioaccumulate in aquatic biota potentially accumulate in the food chain and can cause increased risk to higher trophic level organisms and to exposed human populations via consumption of fish and shellfish. They are also dependent on the media of release and site-specific environmental conditions. The following sections present the potential fate and toxicity of pollutants discharged by TT/CHEM&PETR, and RT/CHEM&PETR facilities, as well as a discussion on pollutants not evaluated in the environmental assessment.

8.6.1 Truck Chemical and Petroleum Discharges

EPA identified 95 pollutants of concern (priority, nonconventional, and conventional) in waste streams from TT/CHEM&PETR facilities. Most of these have at least one known toxic effect. Based on available physical-chemical properties and aquatic life and human health toxicity data for these pollutants, 19 exhibit moderate to high toxicity to aquatic life; 57 are human systemic toxicants; 19 are classified as known or probable carcinogens; 32 have drinking water values; and 26 are designated by EPA as priority pollutants. In terms of projected environmental partitioning among media, 29 of the evaluated pollutants are moderately to highly volatile; 36 have a moderate to high potential to bioaccumulate in aquatic biota; 22 are moderately to highly adsorptive to solids; and 19 are resistant to biodegradation, or are slowly biodegraded.

8.6.2 Rail Chemical and Petroleum Discharges

EPA identified 85 pollutants of concern (priority, nonconventional, and conventional) in waste streams from RT/CHEM&PETR facilities. Most of these have at least one known toxic effect. Based on available physical-chemical properties and aquatic life and human health toxicity data for these pollutants, 22 exhibit moderate to high toxicity to aquatic life; 42 are human systemic toxicants; 14 are classified as known or probable carcinogens; 19 have drinking water values; and 16 are designated by EPA as priority pollutants. In terms of projected environmental partitioning among media, 16 of the evaluated pollutants are moderately to highly volatile; 34 have a moderate to high potential to bioaccumulate in aquatic biota; 24 are moderately to highly adsorptive to solids; and 21 are resistant to biodegradation, or are slowly biodegraded.

8.6.3 Pollutants Not Included in the Environmental Modeling

The impacts of three conventional and eight nonconventional pollutants are not evaluated when modeling the effect of the proposed regulation on receiving stream water quality and POTW operations or when evaluating the potential fate and toxicity of discharged pollutants. These pollutants are total suspended solids (TSS), 5-day biological oxygen demand (BOD_5), oil and grease, chemical oxygen demand (COD), total dissolved solids (TDS), total organic carbon (TOC), surfactants, total phosphorus, total phenols, adsorbable organic halides (AOX), and total petroleum hydrocarbons. The discharge of these pollutants 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 thus primary productivity, or from accumulation of sludge particles that alter benthic spawning grounds and feeding habitats. Oil and grease can have lethal effects on fish, by coating surface of gills causing asphyxia, by depleting oxygen levels due to excessive biological oxygen demand, or by reducing stream reaeration because of surface film. Oil and grease can also have detrimental effects on water fowl by destroying the buoyancy and insulation of their feathers. Bioaccumulation of oil substances can cause human health problems including tainting of fish and bioaccumulation of carcinogenic polycyclic aromatic compounds. High COD and BOD_5 levels can deplete oxygen concentrations, which can result in mortality or other adverse effects on fish. High TOC levels may interfere with water quality by causing taste and odor problems and mortality in fish.

8.7 DOCUMENTED ENVIRONMENTAL IMPACTS

Documented environmental impacts on aquatic life, human health, POTW operations, and receiving stream water quality are also summarized in this assessment. The summaries are based on a review of published literature abstracts, State 304(l) Short Lists, State Fishing Advisories, and contact with State and Regional environmental agencies. States identified five POTWs receiving the discharge from four TT/CHEM&PETR facilities and one RT/CHEM&PETR facility as being point sources causing water quality problems and are included on their 304(l) Short List. All POTWs listed currently report no problems with TEC wastewater discharges. POTWs report past and potential problems for oil and grease, pH, TSS, surfactants, glycol ethers, pesticides and mercury. Several POTW contacts stated the need for a national effluent guidelines for the TEC industry.

State and Regional contacts in seven EPA Regions reported current and past problems (violation of effluent limits, POTW pass-through and interference problems, POTW sludge contamination, etc.) caused by direct and indirect discharges from TEC facilities in the TT/CHEM&PETR and in the RT/CHEM&PETR subcategories. Pollutants causing the problems include BOD, cyanide, hydrocarbons, metals (copper, chromium, silver, zinc), oil and grease, pesticides, pH, phosphorus, styrene, surfactants, and TSS. In addition, States issued fish consumption advisories for waterbodies that receive wastewater from 19 POTWs receiving discharges from 20 TT/CHEM&PETR facilities and two RT/CHEM&PETR facilities. However, the vast majority of advisories are based on chemicals that are not pollutants of concern for the TEC industry.

8.8 REFERENCES

U.S. Environmental Protection Agency. 2000. Environmental Assessment for the Final Effluent Guidelines for the Transportation Equipment Cleaning (TEC) Industry. U.S. Environmental Protection Agency, Office of Water. June.

CHAPTER 9

COSTS AND BENEFITS OF THE TEC INDUSTRY PROPOSED RULE

9.1 INTRODUCTION

9.1.1 Requirements of Executive Order 12866

This chapter 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. A significant rule is one that has an associated annual cost of at least $100 million. This Final Rule does not meet the definition of a significant rule; however, EPA is responding to the spirit of Executive Order 12866 and has prepared an assessment of the social costs and benefits of the final selected regulatory options.

The Executive Order principally requires that EPA identify the need for the rule, compare the benefits of the regulation to the costs of the regulation, and analyze alternative regulatory approaches to the rule. Wherever possible, the costs and benefits of the rule are to be expressed in monetary terms. To address the analytical requirements specified by the Executive Order, Section 9.2 discusses the social costs of the rule and Section 9.3 compares cost and benefits. Chapter 8 discusses the benefits associated with the final TEC industry effluent limitations guidelines, Chapter 2 profiles the industry; Chapter 4 presents technology options and regulatory alternatives; and Chapter 5 discusses the impacts of the rule and its alternatives. Section 9.1.2, below, presents the need for the regulation.

9.1.2 Need for the Regulation

Executive Order 12866 requires that EPA identify the need for this regulation. The discharge of pollutants directly or indirectly into surface water pose a threat to human health and the environment. Human health risks from these discharges include the potential for cancer and other systemic health effects. These discharges may also cause inhibition problems at POTWs. This section discusses: (1) the reasons the marketplace does not provide for adequate pollution control in the absence 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 effluent limitations guidelines 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. The Office of Management and Budget (OMB) defines market failure as the presence of externalities, natural monopolies, and inadequate information (Katzen, 1996). 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 society. 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 their business (i.e., internalized cost and benefits); however, the cost of environmental pollution is not assumed solely by the creators of the pollution. All individuals in the polluted area share the social cost of exposure to the pollution. Although owners and operators might be the creators of pollution, they do not exclusively bear the full costs of the pollution. Government regulation is an attempt to internalize the costs of pollution.

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

Individual negotiation often does not occur in an unregulated market 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 obstacle 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. 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 TEC 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. Certain subcategories within this industry release 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.

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).

9.2 SOCIAL COSTS OF THE RULE

In the Development Document (U.S. EPA, 2000), EPA estimated 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.

9.2.1 Cost Categories

Social costs of a regulation comprise costs that go beyond compliance costs, the costs of purchasing, installing, and operating pollution control equipment. Some of these additional costs are monetary, but many are nonmonetary. Additional monetary costs include the costs of administering a regulation 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. This section discusses in more detail the types of costs that may be components of a social cost estimate. Section 9.2.2 presents the estimates for the cost categories to which EPA could assign monetary values.

9.2.1.1 Compliance Costs

The largest component of social cost is the cost to the TEC industry of complying with the regulation. These costs have been discussed in Chapter 5 and reflect the cost of upgrading all facilities to meet effluent limitations guidelines. Chapter 5 includes posttax and pretax annualized costs. Posttax costs measure the costs to industry after compliance costs have been expensed or depreciated for tax purposes and income taxes have been paid on earnings. Posttax costs reflect the tax shield on compliance costs and reflect the costs the industry would incur to respond to the rule. 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. Pretax costs, then, are an appropriate measure for estimating the social costs of regulation. In addition, because the costs to society are being calculated in this section, EPA uses the social discount rate of 7 percent, as recommended by OMB (Katzen, 1996) rather than the private discount rate (although the average private rate is almost identical to the social discount rate in this instance).[1]

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[1] The annualized costs presented in Table 5-1 were calculated using the facility specific discount, not the social discount rate.

9.2.1.2 Administrative Costs

Implementing the proposed TEC industry effluent limitations guidelines and standards will require permitting authorities to incur costs for writing, monitoring, and enforcing permits under the regulation. These administrative costs add to the resource cost of regulatory compliance and are part of the total social cost of the regulation. Sections 9.2.2.2 and 9.2.2.3 present the methodology and estimates for administrative costs of the proposed rule.

9.2.1.3 Worker Dislocation and Benefit Administration Costs

As discussed in the proposal EA report (U.S. EPA, 1998), any worker dislocation costs can be adequately accounted for by the pretax costs of compliance for the following reasons:

- There is no change in in-house facility output, thus:

  The pretax annualized social cost of the regulation is identical to the loss in producer surplus.

  There are zero worker dislocation costs.

  The loss in producer surplus is a transfer payment to other industries, not a net loss to society.

- The existing methodology for calculating the social dislocation cost of worker unemployment is seriously flawed.

- In the commercial sector, the pretax annualized social cost of the regulation overestimates the loss in producer and consumer surplus, thus providing a proxy for some social dislocation cost of worker unemployment.

- The pretax annualized social cost of the regulation takes no account of the benefits of offsetting output and employment gains in industries providing wastewater treatment services and equipment.

EPA therefore believes that the pretax social cost of the regulation is the best proxy for the social cost of the regulation, including the cost of worker dislocation.

The unemployment administrative cost associated with this impact is simply the cost of processing unemployment claims multiplied by the number of unemployed workers. As mentioned earlier, the unemployment benefits themselves are a transfer payment, not a net loss to society. These costs are estimated in Section 9.2.2.3.

9.2.1.4 Nonmonetary Costs

The cost estimate section 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. Much of the technology currently in use is very old, and there has not been a major trend toward innovative technology. In addition, facilities with in-house TEC operations would most likely focus on innovations in their primary business rather than TEC operations. Nevertheless, the rule might have some, although slight, impact on the rate of innovation. The industry might invest in newer technologies if it does not have to allocate resources to meeting the requirements of the proposed TEC standards.

9.2.2 Estimate of Social Costs

9.2.2.1 Costs of Compliance

Table 9-1 presents the capital and annual costs for the proposed option for each regulated subcategory. As described above, an OMB-recommended 7 percent real discount rate is used to annualize the costs. The proposed rule has a pretax annualized compliance cost of $15.0 million.

9.2.2.2 Administrative Costs

EPA used the methodology developed for the Metal Products and Machinery (MP&M) effluent guideline to estimate administrative costs of the proposed rule (U.S. EPA, 1995). EPA estimated the incremental administrative costs of administering the regulation for these facilities in the following five categories:

TABLE 9-1

SOCIAL COST OF COMPLIANCE

Subcategory	Proposed Option	Costs (1994 Dollars) Capital	O&M	Annualized
TT/CHEM&PETR	1	$51,430,699	$8,030,113	$13,457,481
RT/CHEM&PETR	2	$7,037,479	$659,146	$1,402,724
TB/CHEM&PETR	1	$85,126	$125,886	$134,631
Total*		$58,553,304	$8,815,145	$14,994,836

*Does not include costs for TT/CHEM&PETR and RT/CHEM&PETR direct dischargers and TB/CHEM indirect dischargers due to business confidentiality. These subcategories combined account for less than 1 percent of costs to the TEC industry.

Permit application and issuance (developing and issuing concentration-based 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 non-compliance reports; and reviewing a permittee's compliance schedule report for a permittee in compliance and a permittee not in compliance)

Repermitting

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 captures the bulk of the administrative burden of the proposed rule.

Table 9-2 lists permitting activities and their associated costs and assumptions. The Final Rule incorporates concentration-based permits and the costs reflect this basis for the permit. EPA adjusted the costs from 1989 dollars, as presented in U.S. EPA, 1995 to 1994 dollars using the Producer Price Index (reflecting inflation in the costs of production, CEA, 1997).

The administrative cost estimate assumptions specific to the proposed TEC rule include:

EPA does not expect the administrative costs associated with the NPDES industrial permit program to increase as a result of the TEC rule. All direct discharging facilities in the TT/CHEM&PETR, RT/CHEM&PETR, and TB/CHEM&PETR therefore incur no incremental administrative costs. Administrative costs for these facilities may decrease because the technical guidance provided by EPA as a component of the rule may provide information to the permitting authorities that is likely to reduce the research required to develop permits. These cost savings have not been estimated and are not included in the administrative costs of the rule.

All 320 estimated indirect discharging facilities in the TT/CHEM&PETR, RT/CHEM&PETR, and TB/CHEM&PETR subcategories are assumed to bear the costs of issuing a concentration-based permit to a previously unpermitted facility. This is conservative because approximately 22 RT/CHEM&PETR and 180 TT/CHEM&PETR facilities have some type of wastewater permit. These permits may vary widely in form and function, but it is assumed that they are generally not of the scope mandated by the federal pretreatment standard permit system.

TABLE 9-2

ADMINISTRATIVE COST COMPONENTS AND FREQUENCY PER FACILITY

Activity	Frequency	Percent of Facilities for Which Activity is Required	Cost Estimates (1994 Dollars) Low	Average	High
Develop and issue a concentration-based permit at a previously unpermitted facility	1 time	100%	$158	$256	$355
Provide technical guidanc	1 time	100%	$40	$197	$355
Conduct a public hearing	1 time	5%	$1,182	$1,576	$1,970
Conduct an evidentiary hearing	1 time	5%	$9,851	$13,792	$17,731
Permittee Inspection		100%	$55	$500	$946
Flow <= 1 million gal/yr	every 5 years				
Flow > 1 million gal/yr	annuall				
Sample and Analyze Permittee's Effluent		100%	$320	$766	$1,476
Flow <= 1 million gal/yr	every 5 years				
Flow > 1 million gal/yr	annuall				
Review and Data Entry of Permittee's Self-monitoring Reports		100%	$30	$40	$50
Flow <= 1 million gal/yr	every 5 years				
Flow > 1 million gal/yr	annuall				
Receive, Process, and Act on a Permittee's Non-compliance Reports	annual		$118	$138	$158
Flow < 6.25 million gal/yr		10%			
Flow = > 6.25 million gal/yr		30%			
Review a Compliance Report for a Permittee Meeting Milestones	1.5 reports a year		$8	$10	$12
Flow < 6.25 million gal/yr		90%			
Flow = > 6.25 million gal/yr		95%			
Review a Compliance Schedule Report Permittee Not Meeting Milestones	1.5 reports a year	20%	$118	$158	$197
Minor Enforcement Action, e.g., Issue an Administrative Order	annual	10%	$315	$631	$946
Minor Enforcement Action, e.g., Impose an Adminstrative Fine	annual	5%	$3,152	$4,728	$6,305
Repermit	annual	100%	$40	$296	$551

Sources: U.S. EPA (1995), Appendix E in U.S. EPA (1998), and CEA, 1997, Table B-63.

- # All 320 estimated indirect discharging facilities are assumed to incur permitting costs in the first year. This is a conservative assumption. Spreading the one-time costs of initial permits over a multi-year compliance schedule would lower the annualized costs.

The frequency and percent of facilities associated with certain permitting activities varies by the amount of wastewater generated (U.S. EPA, 1995). Table 9-3 summarizes the facility counts by flow category.

Table 9-4 summarizes the number of facilities incurring costs by activity for a 16-year period following promulgation of the rule. The 16-year period is consistent with the period used in the cost annualization model for the compliance costs. The only change is the use of the 7 percent real social discount rate for calculating the present value and annualized cost. EPA used the information in Tables 9-2 and 9-4 to calculate low, average, and high estimates for administrative costs of the proposed rule. The estimated average annualized cost of $542,465 is used in estimating the total social cost of the regulation (Table 9-5). Even with the conservative assumptions used in the analysis, administrative costs are about 3.6 percent of the estimated societal compliance costs.

9.2.2.3 Cost of Administering Unemployment Benefits

Based on data from the Interstate Conference of Employment Security Agencies, the average administrative cost per worker of processing unemployment claims was $93.25 in 1989. This cost reflects only the administrative cost of processing claims; unemployment benefits are not included because they are a transfer payment, not a net cost. The cost per unemployment claim was inflated to $103 in 1994 dollars using the Producer Price Index (CEA, 1997). This figure is multiplied by the number of unemployed workers and the resulting cost is annualized at the 3 percent opportunity cost of deferred consumption over the 16 years of the project life (U.S. EPA, 1995). Secondary impacts analysis projects that the change in TEC employment ranges from a *gain* of 123 employees to a *loss* of 195 employees (Section 5.5). Total annualized costs of administering unemployment benefits range from $0 to $1,700.[2]

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[2] Because other costs and benefits are estimated to the nearest $100,000, the entry for Table 9-6 for the Total Social Cost of the regulation is unchanged.

TABLE 9-3

FACILITY COUNTS BY FLOW CATEGORY

	Number of Facilities			
Flow Category	**RT/CHEM &PETR**	**TB/CHEM &PETR**	**TT/CHEM &PETR**	**Total**
Less than 1 million gallons per year	7	2	64	73
Between 1 and 6.25 million gallons per year	22	2	193	217
At least 6.25 million gallons per year	0	1	29	30
Total	29	5	286	320

Numbers may not sum to total due to rounding.
[1] Based on Detailed Questionnaire data.

TABLE 9-4

FACILITY COUNTS BY YEAR AND ADMINISTRATIVE ACTIVITY

	Facility Counts [2, 3]															
	Year Relative to Rule Promulgatio															
Activity [1]	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Issue a permit [4]	320															
Provide technical guidance	320															
Conduct a public hearing	16															
Conduct an evidentiary hearing	16															
Inspect a permittee	320	247	247	247	247	320	247	247	247	247	320	247	247	247	247	320
Sample effluent	320	247	247	247	247	320	247	247	247	247	320	247	247	247	247	320
Review self-monitoring report	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320
Process NCR	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
Review CSR: in compliance	290	290	290													
Review CSR: not in compliance	64	64	64													
Re-permit						320					320					320
Issue administrative order	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Enforcement seeking penalt	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16

[1] See Table 9-2 for assumptions.
[2] Based on detailed questionnaire database.
[3] Facility counts shown rounded to zero decimal place.
[4] All facilities permitted in first year; compliance schedule assumed to span three years.

TABLE 9-5

ADMINISTRATIVE COST OF THE REGULATION

Estimate	Annualized Administrative Cost of the Proposed Rule (1994 Dollars)
Low	$216,887
Average	$542,465
High	$943,364

9.3 COMPARISON OF ESTIMATED COSTS AND BENEFITS

Table 9-6 presents the social costs and benefits of the proposed rule. As the table shows, the proposed TEC industry options are associated with costs totaling $15.5 million, with total benefits ranging from $1.4 million to $5.0 million. The benefits estimate does not include the dollar value of many important benefits for which monetized estimates could not be developed. Examples of nonmonetized benefit categories include: noncancer related health benefits, reduced POTW maintenance, reduced costs for POTWs to write individual permits, enhanced diversionary uses, improved aesthetic water quality near discharge outfalls, enhanced water-dependent recreation other than fishing, benefits to wildlife or endangered species, tourism benefits, and biodiversity benefits.

9.4 REFERENCES

CEA. 1997. Economic report to the president. Table B-63. Washington, DC: Council of Economic Advisors. February.

Katzen. 1996. Katzen, Sally. Economic analysis of federal regulations under Executive Order No. 12866. Memorandum from Sally Katzen, OMB, to members of the regulatory working group. Washington, DC: Office of Management and Budget. January 11.

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. EPA 821-R-95-023. Washington, DC: U.S. Environmental Protection Agency, Office of Water. April.

U.S. EPA. 1998. Economic Analysis of Proposed Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA 821/B-98-012. Washington, DC: U.S. Environmental Protection Agency, Office of Water. May.

U.S. EPA. 2000. Development Document for the Final Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA-821-R-00-012. Washington, DC: U.S. Environmental Protection Agency, Office of Water. June.

TABLE 9-6

TOTAL COSTS AND BENEFITS OF THE FINAL TEC RULE
(Millions 1994 Dollars)

Type of Cost or Benefit	Total Social Costs or Benefits
Compliance Costs	$15.0
Administrative Costs	$0.5
Administrative Costs of Unemployment	$0.0 - $0.002
Total Social Costs	$15.5
Human Health (Cancer) Benefits	$0.05 - $0.3
Recreational Benefits	$0.9 - $3.2
Nonuse Benefits	$0.4 - $1.6
Total Benefits	$1.4 - $5.0

Numbers may not sum to totals due to rounding.
Source: Chapter 8

CHAPTER 10

UNFUNDED MANDATES REFORM ACT

Title II of the Unfunded Mandates Reform Act of 1995 (Public Law 104-4; UMRA) establishes requirements for Federal agencies to assess the effects of their regulatory actions on State, local, and tribal governments as well as the private sector. Under Section 202(a)(1) of UMRA, EPA must generally prepare a written statement, including a cost-benefit analysis, for proposed and final regulations that "includes any Federal mandate that may result in the expenditure by State, local, and tribal governments, in the aggregate or by the private sector" of annual costs in excess of $100 million.[1] As a general matter, a federal mandate includes Federal Regulations that impose enforceable duties on State, local, and tribal governments, or on the private sector (Katzen, 1995). Significant regulatory actions require Office of Management and Budget review and the preparation of a Regulatory Impact Assessment that compares the costs and benefits of the action.

The proposed TEC industry effluent limitations guidelines are not an unfunded mandate on state, local, or tribal governments because the cost of the regulation is borne by industry. The Final Rule does not impose total costs in excess of $100 million/year. EPA, however, is responsive to all required provisions of UMRA. In particular, the Economic Analysis (EA) addresses:

- Section 202(a)(1)—authorizing legislation (Chapter 1 and the preamble to the rule);
- Section 202(a)(2)—a qualitative and quantitative assessment of the anticipated costs and benefits of the regulation, including administration costs to state and local governments (Chapters 5 and 9);
- Section 202(a)(3)(A)—accurate estimates of future compliance costs (as reasonably feasible; Chapter 5);
- Section 202(a)(3)(B)—disproportionate effects on particular regions or segments of the private sector. No TEC facilities are projected to close as a result of the costs of the selected final options (Chapter 5); therefore there are no disproportionate effects on particular regions or segments of the private sector;

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[1] The $100 million in annual costs is the same threshold that identifies a "significant regulatory action" in Executive Order 12866.

- # Section 202(a)(3)(B)—disproportionate effects on local communities (Chapter 6). No TEC facilities are projected to close as a result of the costs of the proposed option (Chapter 5); therefore there are no disproportionate effects on local governments;
- # Section 202(a)(4)—estimated effects on the national economy (Chapter 5);
- # Section 205(a)—least burdensome option or explanation required (this chapter).

The preamble to the Final Rule summarizes the extent of EPA's consultation with stakeholders including industry, environmental groups, states, and local governments (UMRA, sections 202(a)(5) and 204). Because this rule does not "significantly or uniquely" affect small governments, section 203 of UMRA does not apply.

Pursuant to section 205(a)(1)-(2), EPA has selected the "least costly, most cost-effective or least burdensome alternative" consistent with the requirements of the Clean Water Act (CWA) for the reasons discussed in the preamble to the rule. EPA is required under the CWA (section 304, Best Available Technology Economically Achievable (BAT), and section 307, Pretreatment Standards for Existing Sources (PSES)) to set effluent limitations guidelines and standards based on BAT considering factors listed in the CWA such as age of equipment and facilities involved, and processes employed. EPA is also required under the CWA (section 306, New Source Performance Standards (NSPS), and section 307, Pretreatment Standards for New Sources (PSNS)) to set effluent limitations guidelines and standards based on Best Available Demonstrated Technology. EPA determined that the rule constitutes the least burdensome alternative consistent with the CWA.

10.1 REFERENCES

Katzen. 1995. Guidance for implementing Title II of S.I., Memorandum for the Heads of Executive Departments and Agencies from Sally Katzen, Ad, OIRA. March 31, 1995.

APPENDIX A

IMPACT OF FINAL RULE ON IBC CLEANING

Following is an analysis of the potential effect of TEC compliance costs on Intermediate Bulk Container (IBC) cleanings by TT/CHEM&PETR facilities. Section 1 describes the key assumptions used in this analysis. Section 2 estimates the impact of the Final Rule on the cost of cleaning IBCs by TT/CHEM&PETR facilities. Section 3 projects the impact of those increased costs on the market for IBC cleanings.

The primary sources of data for this analysis are: (1) the Section 308 Survey for information on the number of IBCs cleaned, process wastewater generated, and revenues from IBC cleanings earned by TT/CHEM&PETR facilities, and (2) the best professional judgement of industry representatives for information on wastewater generated per IBC cleaning and the price of IBC cleaning. The Section 308 Survey data dates from 1994. The use of IBCs as tank transportation containers has changed dramatically since 1994. The Agency used the 1994 data, however, because only anecdotal information was available on industry changes since 1994.

A.1 UNDERLYING ASSUMPTIONS

The key assumptions used in this analysis are as follows:

- facility-specific posttax annualized compliance costs are used to calculate the "out-of-pocket" costs to each facility.
- to estimate a range of impacts, IBC cleaning costs are calculated in two ways, using:
  - annual operating and maintenance (excluding monitoring) costs only;
  - total posttax annualized compliance costs (including annualized capital and monitoring costs).
- as a sensitivity analysis, compliance costs are calculated for two groups of facilities:
  - all 286 TT/CHEM & PETR facilities incurring compliance costs
  - only those 80 TT/CHEM & PETR facilities identified in the detailed questionnaire as having cleaned IBCs in 1994.
- facility-specific annualized compliance costs are divided by that facility's annual baseline flow of wastewater to estimate the incremental cost per gallon of wastewater

treated.

- # IBC cleaning prices are taken from a *Brite-Sol* price list: $45 - $55 for an easy rinse-out, $65 - $100 for moderately difficult to clean, $125 - $200 for difficult to clean IBCs (Tinger, 1999).

- # 100 gallons of wastewater are assumed to be generated per IBC cleaned; this is probably an overestimate for an "easy rinse-out" but an underestimate for a "difficult to clean" IBC.

Finally, it should be noted that the estimated post-regulatory IBC cleaning costs described in this appendix are not in addition to previously estimated compliance costs for the TT/CHEM & PETR subcategory (i.e., compliance costs listed in Chapter 5). Facility-specific compliance costs are generated based on all tanks that facility cleans regardless of tank type (U.S. EPA, 2000); this appendix analyzes the impact of those costs on a single type of tank.

Attributing only operating and maintenance compliance costs to IBC cleanings is consistent with an assumption that the primary business of TEC facilities is cleaning tank trucks, and that business decisions at TEC facilities are made primarily with respect to tank truck cleaning. Capital equipment is installed for, and monitoring performed for tank truck cleaning (the primary revenue source). If the facility has equipment to clean tank trucks, and can earn additional revenues cleaning a few IBCs as well, the facility will do so. Under this assumption, the capital expense incurred to clean tank trucks is a "sunk cost" with respect to cleaning IBCs. If the TEC equipment is a sunk cost, a profit maximizing facility compares incremental variable costs of cleaning IBCs with incremental revenues from cleaning IBCs. The only compliance costs attributable to IBC cleaning is the higher cost of treating the wastewater due to the TEC effluent guideline. This approach provides a lower-bound estimate of incremental IBC cleaning costs.

Table A-1 presents the distribution of facilities by percent of IBCs cleaned for TT/CHEM&PETR facilities that reported cleaning IBCs in the Section 308 Survey. Eighty of 322 TT/CHEM&PETR facilities reported cleaning IBCs in 1994. Of those 80 facilities, 69 reported that less than half of their cleanings were performed on IBCs. Since IBCs are smaller than tank trucks, the proportion of TEC revenues derived from IBC cleanings is always smaller than the percentage of cleanings. The same is true of the estimated proportion of TEC wastewater generated by IBCs. Therefore, no facility reported that more than 27 percent of its revenues came from IBC cleanings, and EPA estimated that no more than 38 percent of the wastewater of any facility is generated by cleaning

TABLE A-1

DISTRIBUTION OF TT/CHEM&PETR FACILITIES BY IBCs CLEANED

IBCs as Percent of Tanks Cleaned		Number of TT/CHEM & PETR Facilities	IBC Revenues As Percent of TEC Revenues	IBC Wastewater As Percent of TEC Wastewater [1]
greater than	less than			
0%	10%	36	9%	1%
10%	20%	7	10%	3%
20%	30%	12	4%	4%
30%	40%	7	9%	7%
40%	50%	7	27%	10%
50%	60%	0	0%	0%
60%	70%	0	0%	0%
70%	80%	11	0% [2]	38%
80%	90%	0	0%	0%
90%	100%	0	0%	0%
Total		80	9%	8%

[1] Assumes 100 gallons of wastewater generated per IBC cleaning and 605 gallons per tank truck cleaning.
[2] All cleanings by these facilities performed in-house generating zero TEC revenues.
Source: Detailed Questionnaire Database.

IBCs. These figures support the assumption that IBC cleaning is a secondary source of costs and revenues and costs for TT/CHEM&PETR facilities.

To provide a conservative upper-bound estimate of the impact of Final Rule costs on IBC cleanings, EPA included all capital and monitoring costs in the analysis. In addition, the Agency assumed zero cost pass through for both the lower- and upper-bound impact estimates. Finally, to ensure that impact estimates were not skewed by the exclusion of facilities incurring large compliance costs, EPA performed the analysis based on all TT/CHEM&PETR facilities as well as just that subset of facilities that reported IBC cleanings.

A.2 ESTIMATED REGULATORY IMPACTS ON IBC CLEANING COSTS

Table A-2 shows that Final Rule compliance costs represent a relatively small portion of the price of an IBC cleaning. Compliance costs range from $0.004 to $0.028 per gallon of wastewater treated. Assuming full compliance costs are used to calculate the compliance cost per IBC cleaning, under Option 1 (the selected option for TT/CHEM&PETR) costs represent less than 3 percent of the minimum price ($45) of an IBC cleaning. Under the lower-bound estimate, compliance costs comprise less than 1 percent of the price of an IBC cleaning. If an "easy rinse-out" requires less than 100 gallons of water, as seems probable, then these figures may be overestimates. In all cases, costs are slightly higher for TT/CHEM&PETR facilities that reported cleaning IBCs than for the average of all TT/CHEM&PETR facilities incurring compliance costs.

A.3 IMPACT ON MARKET FOR IBC CLEANING

Projecting the regulatory impact on the market for IBC cleanings is hampered by a lack of data availability. However, some useful characteristics of likely impacts can be outlined based on this limited data. If TT/CHEM&PETR facilities account for a small proportion of all IBC cleanings, then competition will make it difficult for those facilities to pass through any of their compliance costs on IBCs. The demand for IBC cleanings specifically performed by TT/CHEM&PETR facilities would be very elastic, if not perfectly elastic. Option 1 would therefore impose on TT/CHEM&PETR facilities an increase in IBC cleaning costs ranging from 0.9 percent to 2.8 percent per IBC with no increase in their

TABLE A-2

ESTIMATED INCREMENTAL IBC CLEANING COSTS AT TT/CHEM&PETR FACILITIES

Technolog Option	Facilities	Baseline Wastewater Generated (gallons/year)	Posttax Annualized Compliance Costs ($1994)	Compliance Costs per gallon of Wastewater ($1994)	Compliance Costs per IBC Cleaning ($1994) [1]	Compliance Costs per IBC Cleaning as percent of IBC Cleaning Price [2]
Compliance costs excluding capital and monitoring costs						
TT/CHEM&PETR facilities incurring costs						
Option 1	286	831,039,008	$3,168,233	$0.0038	$0.38	0.85%
Option 2	286	831,039,008	$12,864,836	$0.0155	$1.55	3.44%
TT/CHEM&PETR facilities that clean IBCs						
Option 1	80	198,411,099	$880,206	$0.0044	$0.44	0.99%
Option 2	80	198,411,099	$3,610,287	$0.0182	$1.82	4.04%
Compliance costs including capital and monitoring costs						
TT/CHEM&PETR facilities incurring costs						
Option 1	286	831,039,008	$8,367,490	$0.0101	$1.01	2.24%
Option 2	286	831,039,008	$19,131,340	$0.0230	$2.30	5.12%
TT/CHEM&PETR facilities that clean IBCs						
Option 1	80	198,411,099	$2,342,732	$0.0118	$1.18	2.62%
Option 2	80	198,411,099	$5,324,937	$0.0268	$2.68	5.96%

[1] Assumes 100 gallons of wastewater generated per IBC cleaning.
[2] Assumes $45 per cleaning (Brite-Sol "Easy Rinse-Out" price). Percentages should be lower for more expensive cleanings, although the more expensive cleanings may also generate more wastewater.
Source: Detailed Questionnaire database.

revenues. IBC-cleaning competitors would incur no comparable compliance costs, and the market price for IBC cleaning would not increase. There would likely be a small redistribution of IBCs cleanings away from TT/CHEM&PETR facilities towards other facilities. This is the most conservative scenario.

Data submitted by the Association of Container Reconditioners and the National Tank Truck Carriers Association indicates that truck TEC facilities probably clean the majority of IBCs, but TT/CHEM&PETR facilities may only clean a fraction of those (Tinger, 1999). Container reconditioners apparently clean a relatively small proportion of IBCs, and it seems unlikely that they have sufficient excess capacity to expand significantly without incurring additional capital costs. However, it is not possible from available data to estimate the percentage of cleanings by TT/CHEM&PETR facilities affected by the Final Rule compared to IBC cleanings in facilities unaffected by the guideline. If IBCs are excluded from the effluent guideline, any TEC facility can clean IBCs regardless of load. Thus, in addition to container reconditioners, food grade and hopper truck facilities would also be able to clean IBCs without having to meet the TT/CHEM&PETR guidelines. If EPA assumes 1.5 million IBC cleanings are performed by TT/CHEM&PETR facilities out of the estimated several million IBC cleanings per year, then the demand for IBC cleanings by TT/CHEM&PETR facilities is most likely quite elastic.[1]

Note, however, that impacts may be less severe than the most conservative scenario described above. The estimated incremental cost to TT/CHEM&PETR facilities under Option 1 ranges from $0.40 to $1.30 per IBC. The average cost of operating a flatbed tractor trailer truck in 1995 was approximately $1.33 per mile (PFMI, 1996). Thus, even carrying 20 to 30 IBCs per load, there are limits as to how far a truck can deviate from its route in order to find a less expensive TEC cleaning facility. Moreover, TT/CHEM&PETR shippers and carriers that clean IBCs in-house would also face administrative costs in outsourcing IBC cleaning that would offset the increased cost per gallon of wastewater treatment.

Finally, it is unlikely that the exclusion of IBCs from the Final Rule will be sufficient to cause a significant market shift from tank trucks (with regulated cleaning) to IBCs (with unregulated cleaning). Due to economies of scale in bulk transportation, large quantities of a product can be delivered more

[1] The Section 308 Survey indicated approximately 90,000 IBCs were cleaned by TT/CHEM&PETR facilities. Modern Bulk Transporter (MBT, 1997) estimated 475,000 IBCs were in use in 1995. Assuming each IBC is cleaned once per year, a conservative assumption, then TT/CHEM&PETR facilities accounted for a maximum of 20 to 25 percent of IBC cleanings in 1994.

cheaply in a tank truck than an IBC when all costs of transportation such as loading/unloading, direct travel costs, cleaning, and storage at terminals are included (at least above some threshold quantity). If, for example, it takes nine IBCs (800 gallons each) to deliver the same quantity of product as a 7,500 tank trailer, the cost of cleaning nine IBCs may exceed the cost of cleaning the trailer even if the IBC cleaner doesn't have to meet the TEC limitations. Thus, the Agency believes that IBCs are primarily in competition with 55 gallon drums, not tank trucks, and the cost differential between bulk deliveries in IBCs and tank trailers is sufficiently large that any substitution of IBC deliveries for trailer deliveries due to this ELG should be relatively minor.

A.4 REFERENCES

MBT. 1997. US Market for IBCs with Liquid Capacity Exceeds $250 Million. Modern Bulk Transporter. Houston, TX. May.

PFMI. 1996. Private Fleet Benchmarks of Quality and Productivity. Volume VI. National Private Truck Council, Transportation Technical Services, and A. T. Kearney.

Tinger. 1999. Market Analysis for IBC Cleaning. Memo from John Tinger, U.S. EPA, to George Denning, U.S. EPA. May 14, 1999.

U.S. EPA. 2000. Development Document for the Final Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Industry. EPA-821-R-00-012. Washington, DC: U.S. Environmental Protection Agency, Office of Water. June.

APPENDIX B

IMPACTS OF COMBINED TEC ELG AND SURFACE COATINGS NESHAP ON TB/CHEM&PETR FACILITIES

On December 15, 1995, the U. S. Environmental Protection Agency (EPA) issued a national emission standard for hazardous air pollutants (NESHAP) to control air emissions from surface coating operations at shipbuilding and ship repair facilities. Because many shipbuilding and repair facilities also perform TEC operations—the TEC operations are often performed in order to undertake barge and ship repairs—EPA performed a sensitivity analysis to examine whether the combined compliance costs of meeting both the NESHAP standards for the shipbuilding and repair industry and the ELG standards for the TEC industry might cause TB/CHEM&PETR facilities to incur additional impacts.

The NESHAP applies to shipbuilding and repair facilities that use more than 1,000 liters or more of paints, solvents and other surface coatings per year. Of the more than 470 shipbuilding and repair facilities in the U.S., EPA projects that only about 35 facilities will be affected by the NESHAP (U.S. EPA, 1997). Thirty-one of the 35 affected facilities were identified by name; only one of these 31 facilities can be identified as a member of the TB/CHEM&PETR subcategory. For the purposes of this analysis, however, EPA assumes that all TB/CHEM&PETR facilities that indicate they perform repair, painting or related activities, and employ at least 75 workers will also be affected by the NESHAP standards.[1]

Based on detailed questionnaire data on the number of workers employed and operations typically performed at each facility, EPA determined that one TB/CHEM&PETR facility meets the subcategorization classification for a large construction shipyard used for the NESHAP standards, and eight facilities meet the subcategorization classification for a medium ship repair facility; of these eight facilities, three qualify for the TEC low flow flow exclusion. It is unlikely that the six remaining TB/CHEM&PETR facilities will be affected by the NESHAP standards due to their small size. Thus a total of six TB/CHEM&PETR facilities are likely to incur compliance costs under both the surface coatings NESHAP and the TEC Final Rule. Furthermore, two of these six TB/CHEM&PETR facilities are indirect dischargers and therefore incur only monitoring costs under the TEC standards.

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[1] The smallest facility EPA identified as affected by the NESHAP standards employs 150 workers.

Average estimated compliance costs for meeting the NESHAP standard—$165,300 per year for the large shipbuilding facility, $23,200 per year for the medium repair facilities (U.S. EPA, 1994)—were added to the estimated annualized compliance costs of the TEC Final Rule for the purpose of this sensitivity analysis. Table B-1 presents impacts projected under combined the combined NESHAP and TEC standards and compares them with impacts projected under the TEC standards alone. No additional incremental facility closures are projected nor is there any projected increase of incremental financial distress. An additional two facilities incur annualized post-tax compliance costs that exceed 1 percent of facility revenues when the costs of meeting both the NESHAP and TEC standards are combined (Franz, 2000).

B.1 REFERENCES

Franz. 2000. Estimated Economic Impacts of Combined TEC ELG and Surface Coatings NESHAP on TB/CHEM&PETR Facilities. CBI Memorandum from C. Franz, ERG to TECI Rulemaking Record.

U.S. EPA. 1994. Surface Coating Operations at Shipbuilding and Ship Repair Facilities: Background Information for Proposed Standards. Research Triangle Park, N.C.:EPA 450-D-94-011a. U.S. Environmental Protection Agency. June.

U.S. EPA. 1997. A Guide on How to Comply with the Shipbuilding and Ship Repair (Surface Coating) Operations National Emission Standards for Hazardous Air Pollutants. EPA 453/B-97-001. Research Triangle Park, N.C.: U.S. Environmental Protection Agency. January.

TABLE B-1

ESTIMATED ECONOMIC IMPACTS OF COMBINED TEC ELG AND SURFACE COATINGS NESHAP TB/CHEM&PETR FACILITIES, ASSUMING ZERO COST PASS THROUGH

				Facilities Exceeding Specified Sales Test			
				Pre-tax		Post-tax	
Subcategor	Affected Facilities [1]	Incremental Closures	Incremental Financial Distress [2]	1% Test	3% Test	1% Test	3% Test
Analysis Assuming Compliance with Surface Coatings NESHAP and TEC ELG:							
Large business-owned [3]	6	0	0	2	2	2	0
Small business-owned [4]	0	0	0	0	0	0	0
Total	6	0	0	2	2	2	0
Analysis Assuming Compliance with TEC ELG only:							
Large business-owned [3]	6	0	0	2	0	0	0
Small business-owned [4]	0	0	0	0	0	0	0
Total	6	0	0	2	0	0	0

[1] 4 direct dischargers and 2 indirect dischargers; indirect dischargers incur monitoring costs only.
[2] From Altman-Z" analysis.
[3] One large business facility is a cost center; analyzed at business entity level for the closure model; sales test undefined.
[4] Potentially affected small entities at proposal meet de minimis flow exclusion for final regulation..