REGULATORY IMPACT ANALYSIS OF LAND DISPOSAL RESTRICTIONS FOR NEWLY IDENTIFIED WASTES AND HAZARDOUS SOIL (PHASE II LDRs) FINAL RULE

July 29, 1994

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Washington, D.C. 20460

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EXECUTIVE SUMMARY
REGULATORY IMPACT ANALYSIS OF LAND DISPOSAL RESTRICTIONS FOR NEWLY IDENTIFIED WASTES AND HAZARDOUS SOIL

This report, a regulatory impact analysis, estimates the costs, economic impacts, and benefits due to the Land Disposal Restrictions (LDRs) for newly identified wastes and hazardous soil. The rule has been developed by EPA as part of its legislative mandate to restrict the land disposal of hazardous wastes where necessary to protect human health and the environment.

ES.1 WASTES AFFECTED BY THE RULE

The rule would set land disposal treatment standards for the following wastes:

- organic toxicity characteristic wastes (RCRA waste codes D018 to D043);
- organic toxicity characteristic (D018 to D043) hazardous soil;
- organic toxicity characteristic (D018 to D043) hazardous debris;
- characteristic pesticide wastes that were not previously hazardous using the EP leaching procedure (D012 to D017);
- coke production wastes (K141, K142, K143, K144, K145, K147, and K148); and
- chlorotoluene wastes (K149, K150, and K151).

In addition, the rule establish universal treatment standards (UTS). These standards will update nearly all current concentration-based treatment standards with constituent-specific UTS concentrations. The quantity of wastes affected by the rule are shown in Exhibit ES-1.

ES.2 COST AND ECONOMIC IMPACTS OF RESTRICTING THE LAND DISPOSAL OF PHASE II WASTES

Using data available from EPA's 1992 survey of facilities that manage TC wastes, EPA was able to develop facility-specific cost estimates for the post-regulatory treatment of these wastes. EPA examined the data for each wastestream and assigned an appropriate treatment technology for the post-regulatory alternatives. In addition to organic TC wastes, the Phase II rule affects coke by-product and chlorotoluene wastes, and EPA conducted a facility-specific cost analysis for these affected waste streams.

EXHIBIT ES-1
SUMMARY OF ESTIMATED ANNUAL QUANTITIES OF AFFECTED WASTES

Waste	Volume (tons/year)
Waste Newly Regulated By the LDRs	
Organic TC Wastes (D018-D043)	
Nonwastewaters	167,000[a]
Hazardous Soil	94,000[a]
Hazardous Debris	34,000[a]
Subtotal (rounded) of Organic TC Waste	*295,000*
Characteristic Pesticide Waste Not Hazardous by EP (D012 to D017)	0[b]
Coke Production Waste	0[c]
Chlorotoluene Waste	30
Subtotal (rounded) of Newly Regulated Waste	295,000
Previously Regulated Waste Affected by Changes in LDR Regulations	
Affected By Universal Treatment Standards	1,209[d]
Affected by Recycling Regulation Modifications	3,840
Subtotal (rounded) of Previously Regulated Affected Waste[e]	5,049
Total Quantity (rounded) of Affected Waste	300,000

a/ Quantities presented are based on information contained in 1992 TC Survey questionnaires. They represent projected 1995 generation rates, which EPA assumes are indicative of steady state generation.

b/ As part of the Advance Notice of Rulemaking for the Phase II LDRs, EPA requested data on the D012 to D017 pesticides that exhibit the toxicity characteristic using the Toxicity Characteristic Leaching Procedure (TCLP) but not the Extraction Procedure (EP). EPA received no data in response to this request, and it is assuming that this waste volume will be negligible.

c/ Although there are large wastewater and nonwastewater volumes of coke by-products, none of these volumes is expected to be land disposed. On-site processes constituting treatment (i.e., coking) are the most economical management method for these wastes and are currently widely practiced among coke and tar refining facilities.

d/ The affected universe is defined here as the universe of all wastes to which the UTS apply that are estimated to have cost impacts from the change in treatment levels.

e/ In addition, up to 7 million tons of all previously regulated waste could be affected by the streamlining effect of the UTS. See discussion in Chapter 3.

ES.2.1 Cost of the Rule

Exhibit ES-2 summarizes the results of the cost analysis. *In total, the Phase II LDR rule would have an incremental annual cost of $191 to $219 million (representing accounting or not accounting for waste minimization savings).* Sixty-seven percent of this cost would be for the treatment of organic TC nonwastewater wastes, and 16 percent and 17 percent would be for the treatment of organic TC hazardous soil and debris. In addition, there may be a potential savings of $1 million, associated with previously regulated waste affected by UTS and modifications to the recycling definition. The cost savings associated with waste minimization is estimated to be $25 million. Finally, the streamlining effect of UTS on the treatment of previously regulated waste presents a savings ranging from $0 to $55 million for incinerable wastes and $0 to $41 million for wastes suitable for physical/chemical treatment.

ES.2.2 Economic Impacts of the Rule

For the 14 captive (i.e., non-commercial) facilities in the TC capacity database, only one company would experience serious economic impacts when considering the ratio of incremental compliance cost to cost of operations.

Since no costs are associated with the treatment standards for coke by-products, no economic impacts are expected. Economic impacts for facilities that generate chlorinated toluene wastes are such that no facilities are expected to experience significant impacts as a result of the rule.

EXHIBIT ES-2

SUMMARY OF COSTS ASSOCIATED WITH THE PHASE II LDR PROPOSED RULE

Waste Type	Post-Regulatory Cost (million $/yr)	Baseline Cost (million $/yr)	Incremental Cost (million $/yr)
Newly Regulated Wastes			
Organic TC Wastes (D018- D043)			
Nonwastewaters	174	30	147
Soil	53	17	35
Debris	45	8	37
Chlorotoluenes	0.1	<0.1	<0.1
Waste Minimization Impacts	(25)	N/A	(25)
Subtotal for All Newly Regulated Wastes			
Without Waste Minimization	**272**	**56**	**219**
With Waste Minimization	**247**	**56**	**191**
Previously Regulated Wastes Affected by Rule	0	0.6	(0.6)
K069 Recycling Wastes			
Cyanide Wastes	66.5	66.6	(0.1)

ES.3 BENEFITS OF RESTRICTING THE LAND DISPOSAL OF PHASE II WASTES

EPA's analysis of the benefits of the Phase II LDRs addresses only TC wastes. These wastes dominate the other newly identified wastestreams covered by the Phase II LDRs in terms of volume and costs. EPA evaluated three types of benefits for this RIA: reduction in human health risks via the ground-water pathway, reduction in human health risks via the air pathway, and positive effects on the value of properties near waste management facilities.

ES.3.1 Human Health Risk Reduction — Ground-Water Pathway

EPA analyzed baseline human health risks, i.e., risks posed by untreated TC wastes managed in Subtitle C landfills as well as post-regulatory risks. The difference in risks between the baseline and the post-regulatory condition is a measure of the benefits of the rule.

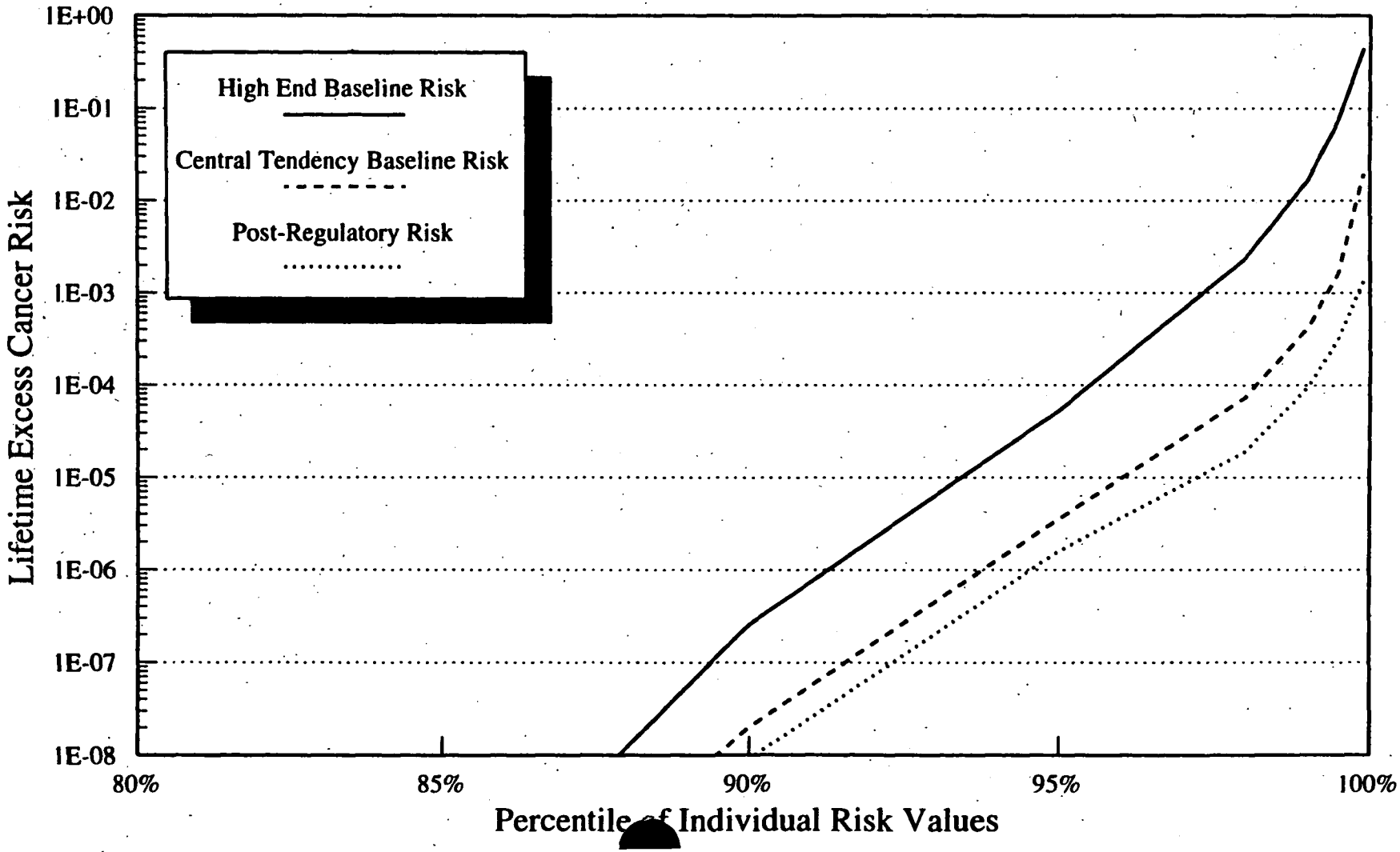
Exhibit ES-3 presents the estimates of the baseline and post-regulatory individual cancer risk across all facilities. The results are presented in terms of a cumulative frequency distribution indicating the percentile level associated with an individual risk level across all facilities. As the exhibit shows, the high-end baseline risk estimate is between one and two orders of magnitude higher than the central tendency estimate across the distribution. About ten percent of the individual risk values indicate baseline lifetime excess individual cancer risk exceeding 10^{-6} under high-end assumptions, with almost five percent exceeding 10^{-4}. About six percent of the individual risk values exceed 10^{-6} in the baseline using central tendency assumptions, including about two percent which exceed 10^{-4}. In the post-regulatory case, about five percent of the individual risk indicate excess cancer risks above 10^{-6}, and about one percent exceed 10^{-4}.

EPA's modeling also indicated estimated that non-caner effects were low. Using central tendency assumptions, the 99th percentile baseline exposure level is less than the reference dose. Under high-end assumptions, about two percent of the distribution exceeds a hazard index of unity, indicating the potential for adverse non-cancer effects. Post-regulatory non-cancer risk, however, is insignificant.

The central tendency estimate of baseline population cancer risk is on the order of 0.24 cases per year. The post-regulatory population cancer risk is about 0.02 cases per year. **In other words, the rule reduces 0.22 cases per year, or 92 percent of the baseline cancer cases.**

EXHIBIT ES-3

Cancer Risk
Via the Ground-Water Pathway



ES.3.2 Human Health Risk Reduction — Air Pathway

Constituents contained in TC waste, soil, and debris may be emitted to air through volatilization and dust entrainment. Reducing the concentrations of TC constituents through the Phase II LDR treatment standards significantly reduces the potential for air emissions, and the risks posed by those air emissions.

In the baseline, 26 of the 35 modeled facilities (74 percent) have individual cancer risks exceeding 10^{-6} at the high-end individual location: 16 have risks between 10^{-6} and 10^{-4}, and 10 facilities have risks greater than 10^{-4}. The highest value is 5×10^{-3}. For the high-end individual location, the non-cancer risk ratio exceeds one at only one facility. Note that these high-end values represent risks to a hypothetical, and not an actual, individual.

The final regulation effectively reduces individual cancer risk. At the high-end individual location, eight facilities have risks exceeding 10^{-6}; the highest individual risk is 8×10^{-6}. Doses of all non-carcinogens are well below reference doses.

Exhibit ES-4 presents population risks. The central tendency estimate of baseline population cancer risk is on the order of 0.037 cases per year. The post-regulatory population cancer risk is about 0.0002 cases per year. **In other words, the rule reduces 0.036 cases per year, or 99 percent of the baseline cancer cases.**

ES.3.3 Effects on Property Values

Treating organic TC wastes would allow them to be disposed of in Subtitle D (i.e., non-hazardous) waste facilities rather than in Subtitle C (i.e, hazardous) waste facilities. To estimate the *potential* benefit resulting from changes in property values that would occur if Subtitle C facilities were replaced by Subtitle D facilities, EPA modified a hedonic pricing/land value study and applied it to the universe of affected facilities. The premise of hedonic property value analysis is that housing prices are determined by a range of attributes of the house, its site, and its neighborhood. If one attribute included in the analysis is an environmental characteristic, the effect of that characteristic on price can be used to estimate the benefits from changes in the level of that characteristic (e.g. a change in the distance to a waste site).

For the purpose of estimation, EPA assumed that each of the 30 captive non-CBI Subtitle C sites would be converted to or replaced with a Subtitle D facility under the LDRs. Using U.S. Census Bureau data, EPA estimated the value and density of owner-occupied houses in the

EXHIBIT ES-4

POPULATION RISK VIA AIR INHALATION PATHWAY

	Estimated Annual Cancer Cases	Estimated Population Exposed Above Reference Dose
Baseline Risk	3.7E-02	768
Post-regulatory Risk	1.8E-04	0
Risk Reduction: Baseline minus post-regulatory risk	3.6E-02	768

region in which each site is located, and calculated the expected number of houses within one mile of each site, and the expected benefit per household for each site.

EPA estimates the potential benefit per house to range from $320 to $450 for houses near the facilities. The total benefits, summed across facilities, are estimated to be about $20 million.

ES.4 LIMITATIONS OF THE ANALYSIS

The analysis has several limitations in scope and methodology. EPA is not considering the impacts of the rule with regard to lab packs or newly regulated characteristic pesticide waste, as standards for these wastes are being changed slightly. Also, EPA is not considering the effects that may be associated with universal standards for all listed wastes or recycling provisions being promulgated.

More important, the cost, economic impacts, and benefits analyses have limitations resulting from both methodology and available data. Some limitations overestimate costs and benefits, others underestimate values, and some limitations introduce uncertainty where the direction of bias is unknown. Sections 3.3, 4.3, and 5.4 of this document detail the limitations of the analysis.

CHAPTER 1
INTRODUCTION

The 1984 Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA) restrict the continued land disposal of hazardous wastes (Section 3004(g)).[1] This section of RCRA specifies a schedule for the restriction of certain land disposal practices of hazardous wastes and directs the Environmental Protection Agency (EPA) to develop a regulatory framework for implementing the land disposal restrictions program.

This report, a regulatory impact analysis, estimates the costs, economic impacts, and benefits which are due to the Land Disposal Restrictions (LDRs) for newly identified wastes. This document fulfills the requirements of Executive Order No. 12866. This executive order requires EPA to determine whether the regulatory action is "significant" and therefore subject to OMB review and the requirements of the Executive Order. This document also fulfills the requirements of the Regulatory Flexibility Act (at 5 U.S.C. 601 et seq.), which requires federal agencies to assess the effects of regulations on small entities and to examine regulatory alternatives that may bring about any adverse economic effects on these small entities.

1.1 LEGISLATIVE MANDATE AND EPA ACTIONS IN RESPONSE TO THE LAND DISPOSAL RESTRICTION PROVISIONS OF HSWA

Through HSWA, Congress directed EPA to restrict the continued land disposal of RCRA hazardous waste and to develop a regulatory framework for implementing the land disposal restrictions by specified dates. As part of this statutory direction, HSWA authorized EPA to promulgate regulations restricting the land disposal of hazardous wastes where necessary to protect human health and the environment.

In addition, HSWA directed EPA to promulgate treatment standards that would substantially diminish the toxicity of hazardous wastes or reduce the likelihood of migration of hazardous constituents from the waste (RCRA Section 3004(m)). Treatment standards may be

[1] As defined in the statute and regulatory framework, land disposal includes, but is not limited to, disposal in landfills, surface impoundments, land treatment facilities, waste piles, salt dome formations, salt bed formations, underground mines or caves, as well as treatment or storage in surface impoundments. Underground injection, a regulated form of land disposal, is addressed in a separate RIA which accompanies the proposed rule.

technology-based (i.e., specified treatment methods that must be employed before land disposal) or concentration-based (i.e., specified concentration levels that must be attained before land disposal). EPA's preference, whenever possible, is to establish concentration-based treatment standards, because this allows the regulated community greater flexibility in complying with the land disposal restrictions.

EPA's progress has been in accordance with the schedule set forth in HSWA. As required, EPA submitted to Congress a schedule for promulgating land disposal restrictions regulations for scheduled wastes on May 28, 1986 (51 FR 19300).

On November 7, 1986 (51 FR 40572), EPA promulgated the land disposal restrictions rule that is referred to as the "framework" rule. This rule set forth much of EPA's land disposal restriction policy as well as treatment standards and effective dates for spent solvents and dioxin-containing hazardous wastes.

On July 8, 1987 (52 FR 25760), EPA promulgated the "California List" land disposal restrictions. In this rule, treatment standards were established for liquid and non-liquid hazardous wastes containing halogenated organic compounds (HOCs), and for liquid hazardous waste containing polychlorinated biphenyls (PCBs). Also, the statutory prohibitions on the land disposal of corrosive wastes and dilute HOC wastewaters were codified, and the hard hammer provisions took effect for free cyanides and California List metals. (The hard hammer provisions in RCRA Section 3004 stipulated that land disposal of specified wastes would be banned altogether if EPA did not promulgate treatment standards within given time periods.)

EPA promulgated the First Third scheduled wastes rule on August 18, 1988 (53 FR 31138). Treatment standards and effective dates for relatively high volume, intrinsically hazardous wastes were established in that rule. EPA promulgated the Second Third scheduled wastes rule on June 23, 1989 (54 FR 26594) and the Third Third scheduled wastes rule on June 1, 1990 (55 FR 22520).

In addition to the above rules, for which specific deadlines were enacted in HSWA, Congress directed EPA to promulgate standards for all newly listed and identified wastes (i.e., wastes brought into the RCRA system after the enactment of HSWA in 1984) six months after promulgating listing rules. These newly identified and listed wastes are being addressed in phases. The first phase, which addressed a group of newly identified wastes and all hazardous debris, was

promulgated on August 18, 1992 (57 FR 37194). This RIA document accompanies the rule for the second phase, which covers a different set of newly identified wastes, including organic toxicity characteristic (TC) wastes, characteristic pesticide wastes that were not previously hazardous using the EP leaching procedure, coke production or by-product wastes, and chlorotoluene waste. The Phase II rule has been under development for several years, and the final rule reflects EPA's consideration of comments received on the Phase II proposed rule (58 FR 48092).

On September 25, 1992, the United States Court of Appeals for the District of Columbia Circuit ruled on the various petitions for review filed against EPA regarding the Third Third rule.[2] The principal holdings of the case with respect to characteristic wastes, under EPA's reading of the opinion, are that (1) EPA may require treatment under RCRA section 3004(m) to more stringent levels than those at which wastes are identified as hazardous; (2) section 3004(m) requires that treatment standards address both short-term and long-term potential hazards posed by hazardous wastes, and consequently must result in the destruction and removal of hazardous constituents as well as removal of the characteristic property; and (3) situations where characteristic hazardous wastes are diluted, lose their characteristic(s), and are then managed in centralized wastewater management land disposal units (e.g., surface impoundments or injection wells) are legal only if it can be demonstrated that hazardous constituents are reduced or destroyed to the same extent they would be pursuant to otherwise applicable RCRA treatment standards.

EPA is taking the position that to minimize the short- and long-term potential hazardous posed by hazardous waste, it is necessary to promulgate treatment standards for the underlying constituents (i.e., non-TC code carrying constituents) likely to be present in characteristic wastes. Not all characteristic wastes will be affected by the Phase II rule, however. EPA will address characteristic wastes managed in Clean Water Act (CWA) systems, CWA-equivalent systems, or Class I Safe Drinking Water Act (SDWA) injection wells in a later rulemaking.

1.2 Organization of This Report

The methodology and results for the analysis of costs, economic impacts, and benefits of the rule are presented in the remaining chapters and appendices of this report:

[2] *Chemical Waste Management, Inc. et al. v. EPA*, 976 F.2d (D.C. Cir. 1992).

Chapter 2	Presents a characterization of the affected wastes and the data sources used.
Chapter 3	Estimates the compliance cost of the rule.
Chapter 4	Describes the economic impacts of the rule.
Chapter 5	Estimates the benefits attributable to the rule.
Appendix A	The Toxicity Characteristic (TC) Survey
Appendix B	Analysis of UTS Impacts Wastestreams with Changing Treatment Standards
Appendix C	Percentage of TC Wastes Assigned to Treatment Technologies by Category of Waste
Appendix D	Unit Costs Used in Analysis
Appendix E	Compliance Cost by TC Waste Code
Appendix F	Example Calculations for Estimating Exposure Concentrations (Human Health Benefits - Air Pathway)
Appendix G	Baseline and Post-regulatory Leachate Concentrations for Carcinogenic Constituents
Appendix H	GEMS/GAMS Modeling Analysis
Appendix I	Waste Minimization Commercial TSD Analysis

Appendix J Summary of Waste Minimization Analysis Telephone Contacts

Appendix K Sensitivity Analysis of Ground-Water Population Risk Assumptions

CHAPTER 2
CHARACTERIZATION OF AFFECTED WASTES

To assess the costs and benefits of setting treatment standards for the waste and contaminated soil addressed in the Phase II LDR final rule, EPA first estimated the quantity of affected waste and soil. In general, the waste and soil affected by the land disposal restrictions are those currently disposed of in landfills, surface impoundments, or land treatment facilities; they may also be stored or treated in waste piles. The Phase II rule also will affect some wastes currently regulated under the LDR program because of new regulatory modifications.

EPA discusses the waste affected by the Phase II LDR rule in two parts of this chapter. In Section 2.1, we discuss waste newly affected by the Phase II rule. In Section 2.2, the Agency discusses waste already regulated by the LDR program that will be affected by the two changes in the regulations: the promulgation of universal treatment standards (UTS), and a modification of the definition of recycled materials. Exhibit 2-1 summarizes the quantities of all wastes affected by the Phase II LDR rule. In brief, the rule will bring into the LDR program an annual quantity of nearly 300,000 tons of waste, and it will change existing requirements for roughly 11,000 tons being generated annually.

2.1 AFFECTED WASTES NEWLY REGULATED BY THE LDRS

The rule will set land disposal treatment standards for the following newly identified and listed wastes:

- organic toxicity characteristic wastes (RCRA waste codes D018 to D043);[1]
- organic toxicity characteristic (D018 to D043) hazardous soil;
- organic toxicity characteristic (D018 to D043) hazardous debris;

[1]The Phase II LDR rule covers organic TC wastewaters as well as organic TC nonwastewaters, soil, and debris. However, it excludes from its scope wastes managed in CWA or UIC-regulated units (LDR standards for these wastes will be included in a future rulemaking). Because virtually all wastewaters are managed in CWA or UIC-regulated units, EPA assumes wastewaters are affected by the Phase II rule.

EXHIBIT 2-1
SUMMARY OF ESTIMATED ANNUAL QUANTITIES OF AFFECTED WASTES

Waste	Volume (tons/year)
Waste Newly Regulated By the LDRs	
Organic TC Wastes (D018-D043)	
Nonwastewaters	167,000[a]
Hazardous Soil	94,000[a]
Hazardous Debris	34,000[a]
Subtotal (rounded) of Organic TC Waste	*295,000*
Characteristic Pesticide Waste Not Hazardous by EP (D012 to D017)	0[b]
Coke Production Waste	0[c]
Chlorotoluene Waste	30
Subtotal (rounded) of Newly Regulated Waste	295,000
Previously Regulated Waste Affected by Changes in LDR Regulations	
Affected By Universal Treatment Standards	1,209[d]
Affected by Recycling Regulation Modifications	3,840
Subtotal (rounded) of Previously Regulated Affected Waste[e]	5,049
Total Quantity (rounded) of Affected Waste	300,000

a/ Quantities presented are based on information contained in 1992 TC Survey questionnaires. They represent projected 1995 generation rates, which EPA assumes are indicative of steady state generation.

b/ As part of the Advance Notice of Rulemaking for the Phase II LDRs, EPA requested data on the D012 to D017 pesticides that exhibit the toxicity characteristic using the Toxicity Characteristic Leaching Procedure (TCLP) but not the Extraction Procedure (EP). EPA received no data in response to this request, and it is assuming that this waste volume will be negligible.

c/ Although there are large wastewater and nonwastewater volumes of coke by-products, none of these volumes is expected to be land disposed. On-site processes constituting treatment (i.e., coking) are the most economical management method for these wastes and are currently widely practiced among coke and tar refining facilities.

d/ The affected universe is defined here as the universe of all wastes to which the UTS apply that are estimated to have cost impacts from the change in treatment levels.

e/ In addition, up to 7 million tons of all previously regulated waste could be affected by the streamlining effect of the UTS. See discussion in Chapter 3.

- characteristic pesticide wastes that were not previously hazardous using the EP leaching procedure (D012 to D017);

- coke production wastes (K141, K142, K143, K144, K145, K147, and K148); and

- chlorotoluene wastes (K149, K150, and K151).

2.1.1 Organic Toxicity Characteristic Wastes

EPA added 26 waste codes representing organic contaminants (i.e., D018 to D043) to the toxicity characteristic as part of the toxicity characteristics revisions rule (March 29, 1990, at 55 FR 11796). The Phase II final rule sets treatment standards for wastes and soil that exhibit the characteristic for these waste codes. To gather information about the generation and management practices of organic TC wastes, EPA conducted a census of facilities land disposing these wastes (OMB Information Collection Request Number 1605).

Design of EPA's 1992 Survey of Organic Toxicity Characteristic Wastes Managed in Land Disposal Units (TC Survey)

In the spring of 1992, EPA conducted a census of all facilities that manage newly identified TC organic wastes in land disposal units or dispose of these wastes in underground injection wells. This survey was an important source of information for the RIA; it is described in detail in Appendix A, and summarized below.

The primary purpose of the survey was to obtain estimates of the quantities, characteristics, and management practices of newly identified organic TC wastes (D018-D043) that would be managed in land disposal units (i.e., landfills, land treatment units, surface impoundments, waste piles and underground injection wells) from 1992 to 1995. The survey focused on waste disposal systems because the land disposal restrictions apply only to those wastes destined for land disposal. The Agency understands that many TC wastes are currently treated (e.g., incinerated) despite the absence of regulatory standards.

For each facility, EPA requested wastestream specific data on newly identified TC organic wastes and information about on-site land disposal units and treatment and recovery systems.

EPA identified the universe primarily based on those facilities which had submitted permit modifications or received interim status for managing newly identified organic TC wastes (D018-D043). EPA used four major data sources to identify facilities suspected of managing these wastes in land disposal units:

- National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR Survey);
- Resource Conservation and Recovery Information System (RCRIS);
- Compliance information compiled by EPA Regional Offices; and
- Underground injection well information compiled by the EPA Office of Water, Underground Injection Control Branch (UICB).

The TSDR survey was used to identify the type of land disposal units at TSDR facilities. RCRIS provided information on whether owner/operators had submitted a Part A or Part B application for changes in management practices (i.e., because the facility was receiving newly identified TC wastes as of September 5, 1991). In addition, OSW had obtained from each EPA region a list of facilities that had submitted Part A applications or Part B modifications for the generation or management of organic TC wastes. Using this information EPA verified the data provided by the TSDR Survey and RCRIS, and also identified 50 additional survey participants. EPA identified the facilities disposing of newly identified TC wastes in underground injection wells from information provided by UICB. Also, EPA assumed that many commercial facilities would manage organic TC wastes; consequently, all commercial landfills and surface impoundments were included as potential survey participants.

EPA initially identified 400 facilities as potential survey participants. Each facility was first called to verify that the facility was managing TC wastes in land disposal units. Based upon this screening, EPA identified 140 facilities that might manage organic TC wastes in land disposal units. Of the 140 questionnaires mailed, 5 were not returned. Forty-four facilities responded that

they do not land dispose TC wastes, and 91 facilities confirmed that they manage organic TC wastes in land disposal units. EPA compiled the data provided by these 91 facilities in a database used for the RIA and capacity analyses for the Phase II LDR rule. More information on the TC Survey and the associated database used for analyses can be found in the background document on the capacity analysis for the Phase II LDRs Final Rule[2], located in the docket.

Use of the TC Survey for this Analysis

The survey requested information on all organic TC wastestreams, even those not affected by the rule (e.g., wastewaters managed in UIC units). For this analysis EPA has selectively used the information developed from the TC Survey. The Agency separated responses from facilities with all organic TC wastes managed exclusively in CWA or UIC-permitted units as well as all TC wastes which also are described with a RCRA listed waste code. EPA applied a series of filters to the remaining wastestreams to obtain the subset of wastestreams reported in the TC Survey that will be affected by the Phase II LDR rule.

Exhibit 2-2 indicates the effect these filters have in reducing the total volume of waste that should be considered as affected by the Phase II LDR rule. The TC survey includes data on 740,000 tons of TC organic waste that is land disposed in units other than CWA or UIC-permitted units. Nearly 60 percent of these wastes, or 430,000 tons per year carry a listed waste code (e.g., F037, petroleum refining waste) in addition to a TC code. The Phase II LDRs will require that listed wastes that also carry an organic TC characteristic code to meet treatment standards for all constituents included in the UTS table. Thus, it is possible for a listed waste, such as K048 (dissolved air flotation float from the petroleum refining industry), that also carries the TC code for benzene (D018) to require treatment for more than the 15 constituents included in the K048 BDAT-derived treatment standards. (See 40 CFR 268.41 and 268.43 for the current requirements for K048 waste.) After a wastestream-specific review of the data, EPA determined that in nearly all cases, meeting the treatment standards based on the listed code would also meet the treatment standards that will result from the Phase II LDRs. Thus, to achieve a more accurate estimate of the quantity of TC waste affected by the rule, wastes carrying both listed and

[2]U.S. EPA/OSW, Background Document for Capacity Analysis for Newly Listed and Identified Wastes and Contaminated Soil to Support 40 CFR 268 Land Disposal Restrictions (Final Rule): Capacity Analysis Methodology and Results, May 1994.

EXHIBIT 2-2

ADJUSTMENTS OF TC SURVEY DATA AS USED IN RIA COST ANALYSIS

Waste	Volume (rounded) (tons/year)
Organic TC Wastes (D018-D043) Land Disposed (As Reported in Survey)	
Nonwastewaters	580,000
Hazardous Soil	123,000
Hazardous Debris	41,000
Total as Reported	744,000
Reduction 1: TC/Listed Wastes Not Requiring Additional Treatment	
Nonwastewaters	407,000
Hazardous Soil	16,000
Hazardous Debris	5,000
Total of Reduction 1	428,000
Reduction 2: Surface Impoundment Closure Quantities	
Nonwastewaters	6,000
Hazardous Soil	14,000
Hazardous Debris	1,000
Total of Reduction 2	21,000
Organic TC Wastes (D018-D043) Land Disposed (As Used In RIA)	
Nonwastewaters	167,000
Hazardous Soil	94,000
Hazardous Debris	34,000
Total used in RIA	295,000

characteristic codes should be subtracted from the total quantity of TC wastes if they do not require further treatment as a result of the Phase II rule (see Exhibit 2-2). EPA identified only 290 tons per year of nonwastewater and 290 tons per year of soil with both listed and characteristic codes that would require additional treatment because of underlying constituents that would have to be treated to reach UTS levels.

The quantities EPA is using in its cost analysis are based on projections made from data in the TC Survey for the year 1995. Because EPA used 1995 as representative steady state volumes, it discounted waste that would be generated in 1995 due to the closure of surface impoundments. EPA did not consider roughly 20,000 tons per year of reported waste in its projection of steady state generation because the waste was generated as part of surface impoundment closures. EPA does not expect additional surface impoundment closures generating TC organic waste to occur since the four-year minimum technology retrofit periods (under authority of RCRA 3005(j)(6)) for both the TC identification rule and the F037 and F038 listing will expire by early 1995. However, these volumes may require treatment in the first year following promulgation of the rule, therefore increasing the estimated cost of the rule in that year.

The final subset of the TC survey that EPA used for its cost analysis consisted of approximately 167,000 tons of nonwastewater, 94,000 tons of soil, and 34,000 tons of debris. These quantities are the sum of 569 nonwastewater streams, 266 soil streams, and 569 debris streams.[3]

After culling out wastes as described above, 47 facilities remained. Eight of these facilities provided confidential business information (CBI) data. Of the 39 non-CBI facilities, 17 (or 44 percent) were petroleum refineries, and an additional 12 (31 percent) were commercial waste management facilities. Exhibit 2-3 indicates how quantities of TC waste affected by the Phase II LDRs are distributed across SIC codes. Exhibit 2-4 indicates how quantities of TC waste affected by the Phase II LDRs are distributed across states. Because three of these facilities did not provide data (e.g., constituent concentrations) necessary for the benefits analysis, only 36 were used to produce the results included in Chapter 5 of the RIA.

[3]The quantities used in this analysis vary slightly from those in the accompanying capacity analysis. The capacity analysis reports 223,000 tons of non-wastewater, 70,000 to 120,000 tons of soil, and 34,000 tons of debris. The difference between the non-wastewater quantities used here and in the capacity analysis stems from our using 1995 projections (as opposed to 1994) and our exclusion of closure wastes.

EXHIBIT 2-3

Distribution of Affected TC Waste By SIC and Physical Form

SIC Code	Debris		Nonwastewater		Soil		Total	
	Tons	Percentage	Tons	Percentage	Tons	Percentage	Tons	Percentage
2812 - Alkalines & Chlorides	175	< 1	126	< 1	605	1	906	< 1
2821 - Plastics	0	0	1,500	1	0	0	1,500	< 1
2869 - Organic Chemicals	1,282	4	1,245	1	2,204	2	4,731	2
2879 - Pesticides	0	0	456	< 1	0	0	456	< 1
2911 - Petroleum Refining	332	1	27,958	17	25,124	27	53,414	18
4953 - Refuse Systems	11,763	34	47,761	29	33,485	36	93,009	32
9511 - Waste Management	111	< 1	9,510	6	277	< 1	9,898	3
Not Available	7,570	22	61,616	37	18,562	20	87,748	30
Unknown	13,233	38	16,363	10	13,351	14	42,947	15
Total	34,466	100	166,535	100	93,608	100	294,609	100

EXHIBIT 2-4

Distribution of Affected TC Waste By State and Physical Form

State	Debris		Nonwastewater		Soil		Total
	Tons	Percentage	Tons	Percentage	Tons	Percentage	Tons
Alabama	1,241	4	2,953	2	3,057	3	7,251
California	10,010	29	5,328	3	24,690	26	40,028
Idaho	929	3	1,704	1	158	-	2,791
Illinois	17	< 1	27,400	16	-	-	27,417
Indiana	2,297	7	16,363	10	2,216	2	20,876
Kentucky	332	1	1,505	< 1	-	-	1,837
Louisiana	2,275	7	20,037	12	11,681	12	33,993
Michigan	10,936	32	630	< 1	11,135	12	22,701
Montana	-	-	65	< 1	1,211	1	1,276
Nevada	49	< 1	176	< 1	1,021	1	1,246
New Jersey	498	1	20	< 1	1,494	2	2,012
New Mexico	-	-	13	< 1	-	-	13
New York	288	< 1	2,905	2	869	< 1	4,062
Ohio	2,348	7	27,262	16	2,615	3	32,225
Oklahoma	111	< 1	9,510	6	277	< 1	9,898
Oregon	-	-	270	< 1	-	-	270
Pennsylvania	-	-	1,500	< 1	-	-	1,500
So. Carolina	1,094	3	2,261	1	367	< 1	3,722

State	Debris		Nonwastewater		Soil		Total
	Tons	Percentage	Tons	Percentage	Tons	Percentage	Tons
Texas	1,263	4	35,083	21	31,764	34	68,110
Utah	778	2	11,050	7	1,053	1	12,881
Washington	-	-	500	< 1	-	-	500
Total	34,466	100	166,535	100	93,608	100	294,609.00

The survey found that the vast majority of TC nonwastewaters are currently managed off-site. The most frequently reported constituent in the organic TC wastes was benzene; the most common waste code among nonwastewaters was D018, constituting 61 percent of the volume requiring off-site commercial treatment. Exhibit 2-5 presents the distribution of affected waste by waste code.

2.1.2 Coke By-products and Chlorotoluene Wastes

The coke by-product wastes hazardous waste listing rule, promulgated on August 18, 1992 (57 FR 37284), identified seven new hazardous waste codes — K141, K142, K143, K144, K145, K147, and K148. Although there are large wastewater and nonwastewater volumes of coke by-products, none is expected to be land disposed. On-site processes constituting treatment (i.e., coking) are the most economic management method for these wastes and are widely practiced among coke and tar refining facilities.

EPA estimates that there are approximately 30 tons of chlorotoluene wastes (i.e., K149, K150, K151) land disposed per year.

2.2 Wastes Already Regulated by the LDRs and Affected by Regulatory Changes

2.2.1 Wastes Affected by Universal Treatment Standards

The Phase II LDR rule will establish universal treatment standards (UTS). These standards will update nearly all current concentration-based treatment standards with constituent-specific UTS concentrations. While the Phase II rule sets UTS levels for both wastewaters and nonwastewaters, EPA expects that the UTS levels will have negligible cost effects on wastewaters, given that nearly all listed-waste wastewaters are managed in tanks and never land disposed. However, EPA evaluated the impacts of applying UTS levels to hazardous nonwastewaters.

EPA assembled a database of the current concentration-based standards (i.e., BDAT standards) and a database of the universal treatment standards. EPA then merged these databases on a waste-code basis to determine the specific waste codes and constituents for which treatment standards would be changing. EPA determined that treatment standards for one or more constituents would change for 155 waste codes, and that in all 498 waste code/constituent

EXHIBIT 2-5

Distribution of Affected TC Waste by TC Code and Physical Form

TC Code	Debris	Nonwastewater	Soil	Total
D018	27,384	89,692	77,097	194,173
D019	271	4,516	266	5,053
D020	16	2,283	325	2,624
D021	228	4,267	1,775	6,270
D022	261	3,978	215	4,454
D023	57	3,899	31	3,987
D024	50	517	30	597
D025	60	310	30	400
D026	1,286	1,681	126	3,093
D027	244	1,144	1,795	3,183
D028	337	7,997	1,408	9,742
D029	324	3,712	1,930	5,966
D030	363	513	1,757	2,633
D031	13	205	17	235
D032	68	3,339	61	3,468
D033	103	452	60	615
D034	29	414	60	503
D035	293	4,206	416	4,915
D036	238	327	628	1,193
D037	227	614	336	1,177
D038	538	2,312	567	3,417
D039	1,069	6,892	2,944	10,905
D040	878	6,591	1,634	9,103
D041	22	110	17	149
D042	22	122	17	161
D043	85	16,442	66	16,593
Total	34,466	166,535	93,608	294,609

treatment standards would be altered. Appendix B shows which constituents will be changing for each of these waste codes.

Using engineering judgment, EPA evaluated what shifts in management practices the changes in concentration-based standards for these 155 waste codes would cause. EPA determined that relatively few waste codes would be significantly affected, i.e., allow the use of a different treatment, and that only two parameters, total and amenable cyanide concentrations, would be responsible for all shifts in management practices.

EPA believes that the lack of impact of implementation of the UTS standards is due to two causes. First, generally the direction of all concentration-based standards for the constituents within a treatability group must be the same before a waste can be managed differently. That is, constituent standards, must either decrease or remain the same if a less stringent treatment is to be allowed. It would not work, in general, if some constituent standards decrease while others increase. Second, stabilization is usually the most preferable way of treating contamination with metal constituents, regardless of the concentration-based treatment standard that must be attained.

EPA identified twelve waste codes that had existing treatment standards for cyanide for which concentration standards would be increased (i.e., become less stringent) by a factor of 10 or more: F011, F012, P021, P029, P030, P063, P074, P098, P099, P104, P106, and P121. EPA used 1991 Biennial Reporting System (BRS) data to determine which wastestreams carried one or more of these waste codes. Exhibit 2-6 presents these wastestreams and indicates how EPA arrived at its estimate of the quantity of waste affected by the UTS. For each wastestream included in Exhibit 2-6, EPA again applied engineering judgment, this time to determine if the combined treatment standards for the wastestream, <u>based on all the waste codes present</u>, would allow a less expensive treatment, typically stabilization, to take the place of the BDAT treatment, alkaline chlorination. Very often, the pressure of an origin waste code not exhibiting cyanide, would dictate that treatment based on incineration would still be required; thus there would be no change in treatment technologies. EPA's analysis indicates that a total of 1,209 tons of waste could have been treated using a less expensive treatment technology in 1991 if the UTS had been in place. EPA assumes that this result is the best projection for the future quantity of waste that will be affected by use of the UTS.

EXHIBIT 2-6
ANALYSIS OF CYANIDE WASTESTREAMS POTENTIALLY AFFECTED BY THE UTS

WASTESTREAM WASTE CODE(S)	QUANTITY REPORTED IN 1991 BRS (TONS)	AFFECTED BY UTS LEVEL*
F006 F007 F008 F009 F011	172,784	N
D001 D002 D003 D004 D007 K011 K013 P003 P016 P030 P063 P098 P101 P105 P106 U001 U002 U003 U004 U008	19,040	N
F001 F002 F005 F008 F011	15,509	N
D001 D002 D003 D004 D008 D009 D010 D011 D012 D018 K001 K037 K045 K048 K049 K051 P012 P015 P030 P041 U048 U056 U088 U098 U112	3,399	N
D001 D002 D003 D004 D005 D006 D007 D008 D009 D010 D011 D039 F001 F002 F003 F004 F005 F006 F007 F008 F009 F011 F019 P005 P022	2,095	N
D001 D002 D003 D004 D005 D006 D007 D008 D009 D010 D040 D043 F001 F003 F008 F011 F019 F037 K011 K013 K090 K094 P065 P070 U050	1,992	N
D001 D003 D018 D038 F039 K011 K013 K014 P063 U002 U009	1,495	N
F002 F003 F004 F005 P063 U002 U012 U038 U044 U131 U154 U239	904	N
D001 D002 D003 D004 D005 F032 K008 K010 K084 K117 K123 K124 K126 K131 P074 P106 P123 U002 U006 U024 U035 U058 U200 U201 U202	809	N
D007 K011 K013 P063 U002 U003 U009	738	N
D001 D004 D005 D006 D007 D008 D009 D010 D011 D018 D019 D020 D021 D022 F001 F002 F003 F004 F005 F006 F007 P022 P030 U080 U122	641	N
P106	530	Y
F006 F012	419	Y
D003 D004 D005 D006 D007 D008 D011 F002 F006 F007 F008 F009 F011 F012 F019 P011 P021 P029 P030 P074 P104 P106 P121 U061	296	N
D001 D002 D007 D009 F001 F002 F003 F004 F005 F039 P106 P120 U002 U019 U052 U056 U080 U122 U154 U159 U161 U196 U211 U220	229	N
F001 F002 F003 F004 F005 F006 F007 F012 F019	203	N
D006 F001 F002 F003 F005 F006 F007 F008 F009 F019 K062 P029 P030 P098 P104 P106 P121 U019 U031 U044 U080 U134 U188 U210 U220	167	N
D003 D008 D018 D027 D028 D029 D039 D040 F001 F002 F003 F005 P001 P020 P022 P030 P037 P039 P040 P048 P051 P070 P071 P075 P089 P105 P106 P108 P122 P123 U002	109	N
F011	106	Y
D001 D002 P063 P069	95	N
D005 D006 D007 D009 D011 F001 F002 F003 F004 F005 F006 F007 F009 F011	90	N
D006 F001 F002 F003 F005 P006 P021 P029 P031 P033 P068 P076 P078 P098 P105 P106 P122 U088 U089 U115 U127 U129 U133 U134 U135 U189 U246 U249	77	N
K011 K013 P063 U002 U003 U009	41	N
D018 D019 D020 D021 D022 D023 D024 D025 D026 D027 D028 D029 D030 D031 D032 D033 D034 D035 D036 D037 D038 P022 P030 U080 U122	35	N
D001 D002 D003 D005 D007 D008 D009 D040 F001 F002 F003 F005 P030 U002 U012 U044 U122 U220 U221	35	N
F012	23	Y
P030	17	Y
D001 D002 D003 D003 D007 D010 D011 F006 F007 F008 F011 P106	15	Y
D003 F007 F008 P029 P030	15	Y
F006 F007 F008 F009 F011 F012	12	Y
D002 D004 D004 D009 D010 F005 F007 F008 F009 F019 K046 K061 K062 K069 P106	11	N
P001 P004 P005 P010 P018 P020 P030 P037 P039 P041 P048 P050 P058 P059 P063 P068 P070 P071 P089 P094 P105 P108 P123	11	N
D001 D002 D003 D004 D005 F002 F004 F005 K022 K084 K136 P012 P059 P062 P099 P105 P106 P109 U018 U020 U064 U145 U146 U187 U237	10	N
D003 D005 D007 F011 P106	10	Y
P063 P069	8	N
D003 D006 [illegible] D008 F007 F008 F009 F011	[illegible]6	Y
F008 P030 [illegible]	[illegible]	Y
F007 P030	4	Y

* Wastestreams are considered to be not affected (i.e., "N") if additional waste codes present prevent the use of less costly treatment.

EXHIBIT 2-6
ANALYSIS OF CYANIDE WASTESTREAMS POTENTIALLY AFFECTED BY THE UTS

WASTESTREAM WASTE CODE(S)	QUANTITY REPORTED IN 1991 BRS (TONS)	AFFECTED BY UTS LEVEL *
P029 P030 P098 P104 P106	4	Y
D003 D004 D005 D006 D007 D008 D009 D010 D011 F007 F008 F009 F010 F011 F019	4	Y
D001 D002 D003 D004 D007 D011 K011 K013 P003 P016 P030 P063 P106 U001 U002 U003 U004 U009 U019 U053	4	N
D001 F008 F011	4	Y
D003 D007 P106	3	Y
D003 F002 F008 P098 P106	3	N
D003 F012	3	Y
P121	3	Y
D002 D005 D006 D008 P030 U188	2	N
D003 D006 P026 P029	2	N
D007 D008 F010 F011	2	Y
D001 D002 D003 D004 D005 D006 D007 D008 D009 D010 D011 F007 F008 F009 P021 P029 P076 P078	2	Y
D003 P106	2	Y
P063 U003	2	N
P098	1	Y
D003 P030 P106	1	Y
D003 D004 D005 D006 D007 D008 D009 D010 D011 F006 F007 F008 F009 F010 F011 F019	1	Y
D003 P098	1	Y
D002 P068 P076 P078 P098 P105 P106 U115 U189 U246	1	N
D002 D004 D007 D008 P098 P105	1	N
D003 F008 P030 P106	1	Y
P098 P106	1	Y
D003 D011 P104 P106	1	Y
D003 D007 F011	1	Y
P021 P068 P098 P105 P106 P122 U048 U098 U115 U133 U134 U135 U147	1	N
F009 P106 P121	1	Y
D003 P030	1	Y
D003 P106 P121	1	Y
P063	1	Y
D001 D004 D007 D012 D013 D014 D015 D016 D018 D019 D020 D022 D024 D027 D028 D029 D035 D038 D040 F002 F003 F004 F005 P020 P050 P098 P123 U002 U003 U012 U03	1	N
D003 F011	1	Y
D005 F011	1	Y
D003 P029 P106 P121	1	Y
D003 D009 P021 P029 P030 P074 P098 P104 P106 P121	1	Y
P029	1	Y
D008 P106	1	Y
P010 P012 P018 P024 P037 P048 P075 P077 P081 P098 P105 P106 P108 P116 P119 P120 P121	1	N
D005 D007 D008 D010 D011 F007 F008 F011 F012 LABP LABP	1	Y

* Wastestreams are considered to be not affected (i.e., "N") if additional waste codes present prevent the use of less costly treatment.

2.2.2 Wastes Affected by Modifications to Hazardous Waste Recycling Regulations

The Phase II LDR rule also broadens the scope of an existing exclusion to the definition of solid waste to allow certain materials to be recycled in an environmentally beneficial manner. This section provides a brief background of historical developments related to the definition of solid waste before explaining how EPA assessed what types of waste will be affected by changes in the regulations.

In the January 4, 1985, final rule (50 FR 639), known as the LDR framework rule, EPA promulgated an exclusion from the definition of solid waste for secondary materials that are recycled in a "closed loop" (i.e., returned to the original production process in which the material was generated). According to the framework rule, to be considered a closed-loop process three conditions must be met:

(1) The secondary material must be returned to the original process without undergoing significant alteration or reprocessing;

(2) The production process to which the unreclaimed materials are returned must be a primary production process (i.e., a process that uses raw materials as the majority of its feedstock, as opposed to a secondary process that uses spent or scrap materials as the majority of its feedstock); and

(3) The secondary material must be returned as a feedstock to the original production process and must be recycled as part of the process, as opposed to an ancillary process.

The Phase II LDRs will make it easier for industry to recycle materials in an environmentally beneficial manner by removing the second of the three conditions above. The Agency expects that the only effect of this change will be for K069 wastes (emission control dust from secondary lead smelting), since this is the only waste from a secondary process listed as hazardous.

E[illegible]2-7
TREATMENT OF K069 [illegible]ED ON 1991 BRS DATA
(TONS)

		TREATMENT TYPE									
		M011-HTMR	M013-SECONDARY SMELTING	M019-METALS RECOVERY, UNSPECIFIED	M109-SLUDGE TREATMENT, UNSPECIFIED	M111-STABILIZATION/ CHEM. FIXATION	M121-NEUTRALIZATION ONLY	M132-LANDFILL	M141-TRANSFER FACILITY	M999-UNKNOWN CODE	ALL TREATMENT
		TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
WASTE CODE	TREATMENT LOCATION										
K069 ONLY	OFF-SITE TREATMENT	614	67	9	5	85	NONE	NONE	NONE	9	789
	ON-SITE TREATMENT	NONE	90	NONE	NONE	NONE	NONE	NONE	NONE	NONE	90
	SUB-TOTAL	614	157	9	5	85	NONE	NONE	NONE	9	879
K069 & OTHER CODES	TREATMENT LOCATION										
	OFF-SITE TREATMENT	NONE	141	NONE	NONE	1	765	NONE	NONE	NONE	906
	ON-SITE TREATMENT	NONE	NONE	NONE	NONE	1,271	NONE	1,271	74	NONE	2,617
	SUB-TOTAL	NONE	141	NONE	NONE	1,272	765	1,271	74	NONE	3,523
ALL REPORTED K069	TREATMENT LOCATION										
	OFF-SITE TREATMENT	614	208	9	5	86	765	NONE	NONE	9	1,695
	ON-SITE TREATMENT	NONE	90	NONE	NONE	1,271	NONE	1,271	74	NONE	2,707
	TOTAL	614	298	9	5	1,357	765	1,271	74	9	4,402

To determine the quantity of K069 affected by this change, EPA analyzed data from the 1991 BRS database. Exhibit 2-7 indicates the quantities of K069 generated in 1991 and how they were managed. EPA expects that the result of the modification to the exclusion of the definition of solid waste will be to allow recycling for all waste with K069 only. Wastestreams with codes in addition to K069 were included only if the additional codes corresponded to characteristic levels of constituents regulated by the BDAT standards for K069 (i.e., lead and cadmium). K069 wastestreams with other codes (e.g., D010 for selenium toxicity) were not included in this analysis. Exhibit 2-7 indicates that 4,402 tons of affected K069 were generated in 1991. Of this amount, 921 tons (i.e., 614 *plus* 298 *plus* 9) were recovered through recycling processes such as high temperature metals recovery (HTMR) and secondary smelting. Accordingly, EPA assumes the quantity of K069 potentially affected by the Phase II LDR rule is the remaining 3,841 tons of K069. In light of the modifications to the definition of solid waste, this quantity of K069 now will be suitable for management using recovery technologies. Nine facilities account for the affected waste.

2.3 EFFECTS OF WASTE MINIMIZATION

In the Phase II Proposed Rule, the Agency accounted for the effects of waste minimization directly in the volumes used in the RIA from the TC Survey database. Where respondents to the survey indicated that they were in the process of (or had near-term plans to) reduce their waste volumes through waste minimization activities, these estimated reductions were subtracted from the overall volumes on a facility-specific basis. These adjusted volumes became the basis for the regulatory analysis of the Phase II standards.

However, in the RIA for the proposed rule, the Agency raised two concerns regarding its accounting of waste minimization. The first concern was the absence of waste minimization as a potential least-cost compliance alternative for the regulated community in the RIA. The second issue raised was effectively whether the waste minimization identified in the TC survey should be assigned as a part of the baseline scenario or the post-regulatory scenario in the RIA. In other words, would the waste minimization activities identified in the TC survey have been implemented in the absence of the Phase II rule.

For this Phase II Final Rule RIA, the Agency performed a separate waste minimization analysis. Using the TC Survey as its basis, the Agency performed a more detailed accounting of waste minimization, which also addressed the concerns in the proposed rule analysis. The section below describes the methodology and presents the results behind this waste minimization accounting.

2.3.1 Methodology

The methodology for the waste minimization analysis follows six steps:

(1) Develop a profile of the industries affected by the Phase II rule that indicated plans for waste minimization in the 1992 TC Suvey Database.

(2) From the industry profile, select industries to examine in the waste minimization analysis which would be representative of the TC waste universe.

(3) Make telephone data verification calls to facilities within the industries identified in Step 2.

(4) For the facilities participating in the verification, determine the cost components for the post-regulatory and waste minimization scenarios for all wastestreams.

(5) Estimate the total costs/cost savings for the waste minimization and the post-regulatory (i.e.: without waste minimization) scenarios.

(6) Extrapolate results to TC waste universe, and determine overall cost/cost savings as the difference between the post-regulatory and waste minimization scenarios.

The first three steps focus on the characterizing the waste subject to minimization and are discussed in greater detail below. The last three steps focus on estimating the cost impacts of waste minimization. These impacts are presented in detail in Chapter 3.

Step 1. Develop a profile of the industries affected by the Phase II rule that indicated plans for waste minimization in the 1992 TC Suvey Database. The Agency employed the TC Survey to construct the industry profile for the waste minimization analysis. However, not all of the wastestreams represented in the TC Survey are amenable to waste minimization. Therefore, the Agency eliminated wastestreams to derive the relevant universe for the waste minimization analysis.

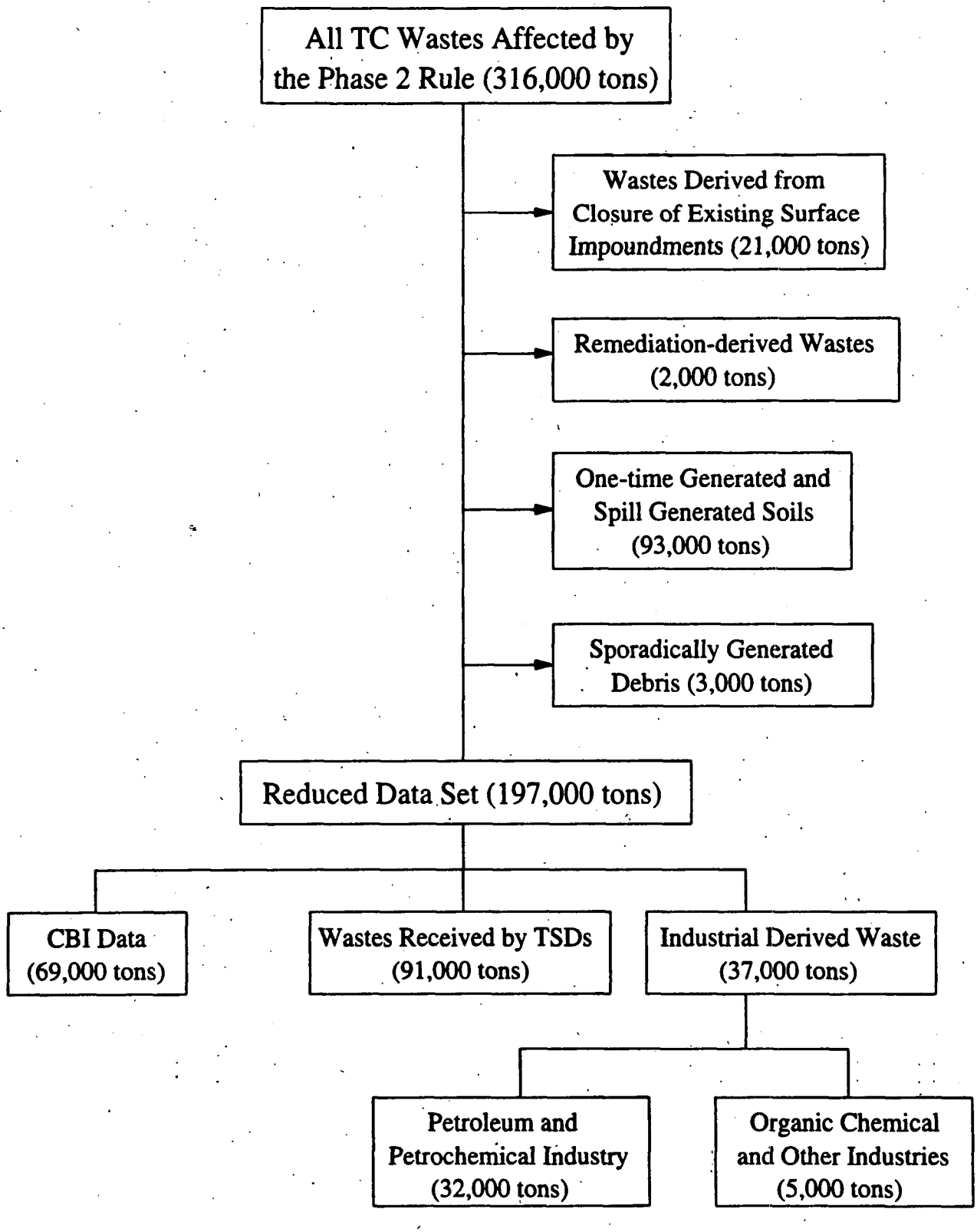
The TC survey contains 316,000 tons of TC wastes that are subject to the Phase II rule. (This is equivalent to the volume after Reduction 1 discussed in Section 2.1.1.) As all of the waste subject to the Phase II rule is not amenable to waste minimization, waste minimization was not considered for wastestreams from the closure of surface impoundments, remediation-derived wastestreams, wastestreams described as soil, and wastestreams described as sporadically generated debris. These wastes were eliminated based on the assumption that they are one-time generated wastes and annual waste minimization cost savings would be small, if any. Exhibit 2-8 shows pictorially how the TC waste tonnage was reduced from 316,000 tons to the "reduced data set" of 197,000 tons.

The "reduced data set" was then divided into three sections based on the facility name knowledge of what that facility does: (1) commercial TSDs, (2) CBI, and (3) industrial waste generator/treater. The largest potential for waste minimization is present at the industrial waste generator/treater.

Commercial TSDs receive waste from generators. The waste minimization potential at the commercial TSDs itself is minimal. The Agency examined the possibility of tracing these waste volumes to the generator through use of the Biennial Reporting Survey (BRS). However, early effort on this approach proved ineffective, and refinements would have been time consuming, with uncertain results. The Agency acknowledges that there are potentially large savings from waste minimization which is not accounted for due to this limitation. Appendix I presents the large quantity wastestreams reported by commercial TSDs that were characterized for waste minimization potential.

For CBI facilities, no wastestream specific information was publicly available (i.e.: no information was non-CBI). The CBI universe of generated waste was assumed to be similar to the non-CBI generated waste, and the cost savings from the non-CBI analysis were extrapolated

Exhibit 2-8: Flow Chart of Methodology to Develop Quantity of Waste Streams Amenable to Waste Minimization



to the CBI wastes.

The results of this data analysis identified 86 non-CBI facilities that responded to the 1992 TC survey. Approximately 87 percent of the facilities that remained were in the petroleum refining industry and the organic chemical manufacturing industry.

Step 2. From the industry profile, select industries to examine in the waste minimization analysis that would be representative of the TC waste universe. As the petroleum refining and organic chemical industries represented the 87% of the volume of wastes subject to the Phase II TC LDRs, these two industries were selected to represent the universe of TC wastes for the purposes of the waste minimization analysis. From these two industries, 16 facilities were identified that both land dispose of their TC wastes on-site and had indicated that they are pursuing or plan to undertake waste minimization activities.

The decision to concentrate on these facilities for phone contact was based primarily on two considerations. First, it was believed that facilities that relied on on-site treatment, primarily land farming or other land application, such as surface impoundments, would have a more immediate need, with the imminent promulgation of the Phase II TC LDR treatment standards, to institute waste minimization activities necessary to reduce the volume of TC wastes produce The fact that these facilities had also indicated on the TC survey that they were pursuing or were planning to undertake waste minimization lent support to this consideration.

Second, the waste volumes generated by these facilities were deemed sufficiently representative of the universe of the TC wastes subject to the Phase II TC LDRs to extrapolate any cost savings from the minimization of these wastes to the remaining balance of the wastes deemed amenable to waste minimization. This consideration took into account that a major component of the newly identified TC wastes was various tank bottoms from crude oil storage and from various intermediate distillate storage.

Step 3. Make telephone data verification calls to facilities within the industries identified in Step 2. To confirm the information on waste minimization provided in the 1992 TC survey, EPA attempted to contact the 16 facilities mentioned above. In addition, if the facilities were willing to provide cost savings information, such data would be collected from up to nine facilities.

The Agency developed a telephone protocol to verify the information in the TC survey database concerning facilities planning to perform waste minimization on Phase II wastestreams. The telephone protocol and the results from the telephone calls are documented in Appendix J.

2.3.2 Results of Waste Minimization on Affected Universe

The waste minimization analysis found that approximately 21,000 tons of waste would not need to be treated due to waste minimization activities. This total quantity represents 14,100 tons of petroleum refinery tank bottoms, 6,400 tons of petroleum refinery lime sludges, and 65 tons of regenerated spent catalyst. The effects of waste minimization on each of these waste types are discussed in greater detail below.

"Reduced Data" The "reduced data" contains 197,000 tons. Exhibit 2-9 presents this "reduced data" broken out by industry, generation category and physical form. Of this "reduced waste", 35 percent is associated with CBI facilities; 46 percent is associated with commercial treatment, storage, and disposal facilities (TSDs); the remaining 19 percent is associated with industrial waste generator/treater. The petroleum and petrochemical industry accounts for 87 percent of the waste at industrial facilities. The waste at the industrial waste generator/treater has the highest potential for determining cost savings from waste minimization.

The generation category of "tank clean out" is a derivative of the replacement of surface impoundments with tank systems. The waste quantity in this category is the estimated quantity of sludge generated in these tank systems. Because waste minimization would take place before wastestreams entered the tank system, and the type of waste entering the tank systems is not well known, the waste minimization potential of these wastes was not evaluated.

Petroleum and Petrochemical Industry Analysis. Routinely generated wastes (8,000 tons) are dominated by a single large wastestream. Shell Oil - Wood River (survey 27) reported a 6,400 ton dewatered lime sludge generated from treatment of benzene contaminated groundwater, dewatered in a filter press. The facility plans to perform waste minimization on this wastestream. A follow up phone call was made to the facility (see Section 3.2) to verify this information.

Exhibit 2-9 Summary of the Reduced Data by Industry, Generation Category, and Physical Form

Industry	Generation Category	Physical Form	Quantity (tons)
CBI	Routinely Generated	Debris	7,000
CBI	Routinely Generated	Nonwastewater	59,000
CBI	Routinely Generated	Nonwastewater-Liquid	300
CBI	Tank Clean Out	Nonwastewater	300
CBI	Sporadic	Nonwastewater	2,000
Subtotal CBI			**69,000**
TSD	Routinely Generated	Debris	24,000
TSD	Routinely Generated	Nonwastewater	45,000
TSD	Sporadic	Nonwastewater	22,000
Subtotal TSD			**91,000**
Petroleum/Petrochemical	Routinely Generated	Nonwastewater	8,000
Petroleum/Petrochemical	Tank Clean Out	Nonwastewater	11,000
Petroleum/Petrochemical	Sporadic	Nonwastewater	13,000
Subtotal Petroleum/petrochemical			**32,000**
Other	Routinely Generated	Debris	20
Other	Tank Clean Out	Nonwastewater	5,000
Other	Sporadic	Nonwastewater	20
Subtotal Other			**5,000**
GRAND TOTAL			197,000

Sporadically generated wastes (13,350 tons) are dominated by "tank bottoms." Eight "tank bottom" streams account for 13,270 tons. Three petroleum refiners indicated waste minimization of tank bottom wastes were being planned or considered.

Additional Tank Bottom Wastestreams. The TC Survey database was searched to find additional "tank bottom" wastestreams. A total of 22 additional streams were found by searching the waste description field for "tank bottom." Of these, six were wastewaters, two were soils, and one was a wastewater treatment sludge. The remaining 13 streams from various industries range in quantity from 0.5 tons to 281 tons and sum to a total of 738 tons. These tank bottoms were not included in the waste minimization calculations.

Catalyst Wastestreams. Conversations with two petroleum refiners involved future plans to recycle catalyst wastestreams. Therefore, the waste description field of the TC Survey database was searched for catalyst wastestreams. Five wastestreams were found. The largest was 232 tons of "OHC catalyst and HCl filter elements" generated by Georgia Gulf Corp. The next largest was 40.5 tons of "spent catalysts and support material from petroleum and refining" generated by Mobil Oil. Marathon Petroleum generated 12.5 tons of "replacement of catalyst from 77C reactor." Ashland Chemical Co generated 7.5 tons of "catalysts fines from VGO reactor, catalyst change." Vulcan Chemical generated 3.9 tons of "spent EDC catalyst from the production of EDC," however, this wastestream is not in the spreadsheet because it also contains a listed waste code.

Organic Chemical Industry. The Agency was unable to contact any facilities that would participate in the verification of data, and therein be included in the waste minimization analysis.

2.4 LIMITATIONS OF THE ANALYSIS

In this RIA, EPA is not considering the impacts of the rule with regard to lab packs or newly regulated characteristic pesticide waste (D012-D017). The standards for these classes of wastes vary only slightly from the original standards, and thus, no significant costs or benefits are

expected. In addition, these waste volumes are expected to be negligible when compared with other wastes addressed in the Phase II rule.

EPA has used data from the TC Survey and the BRS to characterize the affected universe. Both of these data sources have limitations. For instance, hazardous debris was not formally defined by EPA until July 1992, several months after information for both of the data sources used was submitted. Databases such as the TC Survey and the BRS may also be inconsistent with each other because of differences in the information submitted and the procedures used for structuring data.

EPA queried the 1991 BRS to estimate the quantity of solids, sludges, and soils that have only organic TC wastecodes (i.e., D018-D043). This query indicated a total quantity of 193,000 tons, with 70 percent of this comprised of D018 streams. This estimate compares well with the estimates based on the TC survey that are used in this RIA.

EPA's projections of TC waste volumes take into account waste management process modifications indicated in the TC Survey. To the extent that plans for modifications have changed, EPA's estimates for TC wastes may err. Underestimates and overestimates could result from changes in waste management operations that were not indicated in the TC Survey.

Finally, the RIA overlooks some degree of regulation of the land disposal of TC wastes that may presently be occurring. California has enacted legislation that requires that treatment of wastes containing volatile and semi-volatile contaminants before land disposal. The legislature of California has postponed the effective date of this regulation until January 1, 1995,[4] and so EPA believes that these regulations should not be reflected in the affected universe considered for the RIA.

[4] Telephone conversation between John Trever, of ICF Incorporated, and Watson Gin, of the California Toxic Substances Division, April 7, 1994.

CHAPTER 3
COSTS OF RESTRICTING THE LAND DISPOSAL OF PHASE II WASTES

In this chapter, EPA estimates the incremental cost of restricting the land disposal of Phase II wastes by estimating both the costs attributable to post-regulatory management of the waste and the costs associated with the current (or baseline) management of the same waste. The incremental cost is the difference between the post-regulatory cost and the baseline management cost.

3.1 COST ANALYSIS METHODOLOGY

Because of differences in available data, EPA developed separate methodologies for each type of waste affected. The discussion that follows describes EPA's methodologies for this analysis.

3.1.1 Organic Toxicity Characteristic Waste

The organic toxicity characteristic wastes addressed in the Phase II LDR rule and the description of available data were discussed in the previous chapter. Using the data from the TC Survey, EPA was able to develop facility-specific cost estimates for the post-regulatory treatment of these wastes. EPA approached this part of the cost analysis using the following five steps:

Step 1. Create a subset of the TC Survey (and its resulting database) for a more efficient cost analysis by removing wastes that are not affected by the Phase II LDR rule (e.g., wastewaters).

Step 2. For each wastestream in the resulting cost analysis database, review all available information and assign treatment technologies under the post-regulatory scenarios.

Step 3. Collect appropriate unit cost information for treatments assigned.

Step 4. Calculate testing and recordkeeping costs.

Step 5. Create a model to process data and summarize results.

These steps are discussed in detail below.

Step 1. Create a subset of the TC survey database for a more efficient cost analysis. The original TC survey database described in Chapter 2 contained 91 facilities and over 900 wastestream records. Many of these wastestreams (e.g., organic TC wastewaters managed in CWA permitted units, are unaffected by the Phase II LDR rule, as discussed in Chapter 2; consequently, EPA removed them in developing a subset of the database for use in the cost analysis. In addition, EPA removed any waste streams for which the projected 1995 generation was zero. Exhibit 3-1 summarizes the subset of the TC survey database used for the cost analysis. The subset contained facility-specific data for each of the 47 facilities that EPA determined would be affected by the Phase II LDR rule. These data included over 700 wastestream groups, which represented combinations of physical form and waste code, consisting of 295,000 tons of affected waste, soil, and debris.

Step 2. For each wastestream in the resulting cost analysis database, review all available information and assign treatment technologies. For the organic TC wastestreams in the data subset used for the cost analysis, EPA reviewed data records, including the original completed questionnaires, for each wastestream and made a wastestream-specific determination of the treatment technology required to achieve the universal treatment standards promulgated in the Phase II LDR rule for the TC constituents as well as for any underlying constituents. EPA assumed that the treated wastes would be disposed of in a Subtitle D landfill. The baseline management practice was in all cases land disposal at the facility.[1]

- In assigning technologies to treat TC nonwastewaters, EPA followed general guidelines on how these wastes would be treated. For oily TC nonwastewaters, such as wastes that are derived from hydrocarbon, olefin or petroleum production

[1] EPA used the designation "landfill-offsite" for wastes disposed of at commercial facilities receiving wastes from generators.

EXHIBIT 3-1

SUBSET OF TC SURVEY DATA USED FOR COST ANALYSIS

No. of Facilities	Non-Commercial (Company Captive)			30
	Commercial			17
	Total			47
Number of Wastestream Groups[a]		Form of Waste		
		Nonwastewater	Soil	Debris
	D018 — Benzene	54	34	30
	All Other Waste Codes	258	150	185
	Total	312	184	215
Quantity of Waste (tons)		Form of Waste		
		Nonwastewater	Soil	Debris
	D018 — Benzene	89,700	77,100	27,400
	All Other Waste Codes	76,800	16,500	7,100
	Total	166,500	93,600	34,500

a/ Wastestream groups represent combinations of physical form and waste code.

(tank bottoms, gasoline, oil-water emulsions), depending on the oil content, EPA assumed that any of the following technologies would be employed: fuel substitution, chemical treatment, critical fluid extraction, thermal desorption, or biodegradation. However, EPA assumed that TC wastes from hydraulic oils or transformer oils would require incineration in a TSCA-permitted incinerator.

For volatile TC organics, EPA assumed that low temperature thermal desorption, critical fluid extraction, fuel substitution or biodegradation would reach the required levels. For pesticides and other halogenated TC wastes either high temperature thermal desorption or critical fluid extraction followed by incineration of residues was assumed.

Finally, EPA assumed incineration could always meet the treatment levels. However, where certain contaminants exist, incineration was less likely to be used: volatile toxic metals (particularly As, Hg, Se, Pb); toxic nonmetal-oxide formers; corrosive gas-forming halogens; high sodium, calcium, or silicates in the waste; and corrosive inorganic compounds. For residues from incineration, EPA generally believes that low temperature thermal desorption would be used for uncombusted volatiles, and stabilization for metals. Where several technologies applied for a wastestream, EPA generally chose the least costly technology.

For soil contaminated with organic TC wastes, the approach was similar to that used for nonwastewaters: treatment was selected that would meet the universal treatment standards in the Phase II LDR rule. To estimate the cost of treating organic TC soil, EPA first reviewed the TC survey database to select the most likely waste treatment. EPA reviewed the waste description, constituent, and waste management information on each soil wastestream. For soils contaminated only with volatile organic compounds, EPA assumed that vapor extraction or some form of thermal desorption would be used in both soil treatment alternatives. If the waste description or constituent information indicated that toxic metals were

present, EPA generally assumed that the residual from treating the organic would require stabilization. EPA assumed that semi-volatiles, non-volatile, and complex mixtures of contaminants would generally require incineration. In cases where a survey respondent indicated specific plans for treating the waste, EPA assumed this treatment would be selected. EPA did not adjust the data to account for the potential use of treatability variances for contaminated soil.

To determine treatment under each regulatory scenario for debris contaminated with TC wastes, EPA used an approach similar to that described above for soils. However, for debris more emphasis was placed on the waste matrix. For instance, EPA assumed that combustible wastes (e.g., contaminated rags and fabric filters) would be incinerated, as would complex mixtures of relatively small objects. EPA also assumed that washing or chemical extraction would be used for larger objects that would require a great deal of size reduction to allow thermal desorption or incineration.

After technology assignments were made, EPA determined whether in the post-regulatory scenario treatment would occur on-site or off-site. EPA relied on the on-site/off-site designations in the current TC survey database (as developed by the capacity program branch); these designations show that over 99 percent of the TC wastes will be treated off-site (i.e., at commercial facilities). These designations were completed at the time the data were collected as part of an extensive review of survey responses, including follow-up telephone conversations with facility contacts. For this RIA, EPA reviewed each facility's permit status from a recent RCRIS inventory to determine if any of the facilities designated in the database as "off-site for treatment" had active RCRA permits, or have applied for a RCRA permit for on-site treatment. EPA found only one facility that had been issued a RCRA treatment permit, and eight others that had applied for treatment permits. For these nine facilities, EPA changed the designations to "on-site for treatment."

To make its analysis more efficient, EPA examined the number of wastestreams and volumes of waste for each of three categories, nonwastewater, soil, and debris, and determined a

wastestream volume threshold above which over 95 percent of the affected volume would be accounted for. The thresholds were 80 tons per year per wastestream for nonwastewaters, 100 tons per year for hazardous soil, and 25 tons per year for hazardous debris. For these waste streams, a specific technology was not assigned; rather, an average treatment cost developed for each physical form was used. These average costs were calculated by first examining the waste streams with specific technology assignments and calculating the average for each category. By employing these thresholds, EPA was able to reduce the need for wastestream-specific technology assignments, while still accounting for more than 95 percent of the waste volume. Average costs were also assigned to wastestreams that did not have sufficient data to make a technology determination, as was often the case.

Step 3. Collect appropriate unit cost information for treatments assigned. Once wastestream-specific technology assignments were made, EPA estimated the unit costs for each treatment technology. EPA examined several studies and sources for unit costs (see Appendix C for more discussion of unit cost and their sources). First, EPA conducted a thorough literature search to determine costs and prices that have been effective over the past two years. In addition, EPA reviewed nearly 100 Superfund RODs which were signed in 1993 to evaluate information given about the cost of remediation and off-site treatment. Finally, EPA contacted eight commercial treatment suppliers who provide customers with thermal treatment and stabilization for organic TC waste. When necessary, EPA used off-site unit costs from "1990 Survey of Selected Firms in the Hazardous Waste Management Industry," Final Report, July 1992, U.S. EPA Office of Policy Analysis (OPA), or EPA's "Cost and Economic Impact Analysis of Land Disposal Restrictions for Newly Listed Wastes and Contaminated Debris (Phase I LDRS) Final Rule," June 30, 1992. Because vendor price quotes and literature sources usually report unit costs as a range, EPA took the mid-point of each range and then averaged multiple sources, if necessary, to determine a single unit cost for each technology.

The unit costs employed in this analysis assume subtitle D disposal for treated TC wastes. Since virtually all the waste is currently disposed of at commercial facilities (see discussion above), EPA assumed that transportation costs would be the same in both the baseline and post-regulatory scenarios. Finally, when data allowed, as was the case for commercial incineration

prices, EPA adjusted its unit cost values to reflect economics of scale for treating large quantity wastestream.

Step 4. Calculate testing and recordkeeping costs. The development of testing and recordkeeping costs is discussed in detail in section 3.1.4. For organic TC wastes, EPA applied the appropriate baseline and post-regulatory testing costs for each wastestream as well as a facility-specific recordkeeping cost.

Step 5. Create a model to process data and summarize results. EPA developed a series of spreadsheets and datasets to store the data. Data manipulation was then performed using SAS software as well as Lotus 1-2-3. For each wastestream in the database, EPA determined the cost of the baseline and post-regulatory management practice. For example, if a nonwastewater wastestream of 1,000 tons per year had a baseline management cost of $75 per ton and a post-regulatory cost of $1,000 per ton for the standards set in the Phase II LDR rule, the corresponding total costs for the wastestream would be $75,000 in the baseline and $1,000,000 in the post-regulatory scenario. The incremental treatment cost in the post-regulatory scenario would be $925,000.

Costs for each wastestream were summed for each facility by waste form and post-regulatory treatment technology. Testing and recordkeeping costs were added to the sum of all treatment costs to determine a total cost per facility.

3.1.2 Other Regulated Waste

In addition to organic TC wastes and previously regulated hazardous soil, the Phase II LDR rule affects coke by-product and chlorotoluene wastes. EPA conducted a facility-specific cost analysis for these affected waste streams.

Based on an economic analysis of coke by-product waste management performed for the Coke By-Products Listing Final Rule,[2] EPA believes that generators of these wastes will recycle

[2]Cost and Economic Impact Analysis of Listing Hazardous Wastes K141-K145, K147, and K148 from the Coke By-Products (Coking and Tar Refining) Industry, Final Report, June 1992.

rather than dispose of their waste in Subtitle C landfills. Therefore, EPA believes no coke by-product wastes will be affected by this rule.

For chlorotoluene wastes, the baseline practice was assumed to be on-site disposal in a Subtitle C unit. The post-LDR waste management method was assumed to be commercial Subtitle C incineration. The price, including transportation, is $1,320 per ton ($1,200 per ton for incineration and $120 per ton for transport of waste 500 miles).

3.1.3 Baseline Management Practices

For wastes newly regulated by the LDRs, EPA assumed that the baseline management practice is land disposal in a unit meeting Subtitle C requirements. The 40 CFR Part 264 requirements for such units include the installation of a liner and leachate detection and removal system. In addition, the units must have provisions for ground-water monitoring, corrective action, closure, post-closure care, and financial responsibility.

For wastes currently regulated by the LDRs but affected by universal treatment standards, EPA assumed that the baseline management practice is compliance with treatment standards using the best demonstrated available technologies (BDATs) described in LDR technical background documents. For K069, baseline management practices are explicitly indicated in Exhibit 2-7, based on analysis of 1991 BRS data.

3.1.4 Testing and Recordkeeping Costs

In addition to post-regulatory treatment costs, EPA considered testing and recordkeeping costs. (Testing and recordkeeping costs were included in the facility-specific cost estimates developed for organic TC wastes.) There are three times that testing might occur in the context of the LDRs. First, testing may be needed to identify a waste as hazardous (e.g., TCLP); this would occur in the baseline scenario. Second, testing may be needed in the post-regulatory scenario prior to treatment to determine the number and concentration of constituents for which treatment standards are set. Third, testing may be needed to determine in the post-regulatory scenario if a wastestream meets concentration-based treatment standards.

For this RIA, EPA assumes that generators of characteristic wastes will test each wastestream in the baseline to determine the waste's RCRA status, and they will then use their

knowledge of the waste to determine LDR applicability and underlying hazardous constituents. EPA further assumes that waste-generating processes have a four-year effective life; i.e., after four years a given process undergoes significant modification such that its wastestream must be re-characterized. Generators of listed hazardous waste will not test before treatment, but will apply their knowledge of the waste to determine LDR applicability.

Post-treatment testing to demonstrate compliance is required for wastes with concentration-based treatment standards and will be performed after each waste load is treated. EPA assumes that for regularly generated nonwastewaters, four waste loads are treated annually, and for hazardous soils and debris, one waste load is treated annually.

TC Nonwastewaters. For TC nonwastewaters, all underlying constituents must be treated to universal standard levels. Therefore, the waste must be tested before treatment to identify underlying constituents. EPA assumes that a test for all F039 constituents would be conducted. After treatment, the waste must be tested for those constituents identified in the first test, both the original TC constituents and the underlying constituents. Based on the TC survey, EPA estimates that the average wastestream will need to be tested for five constituents.

Phase II Newly Listed Wastes. The coke production wastes (i.e., K141-K145, K147, and K148) and the chlorotoluene wastes (i.e., K149-K151) will not require a pre-treatment test because generators can use their knowledge of the waste to determine applicability of the LDRs. After treatment, these wastes will require testing to determine that the concentration standards have been met. For each waste, there are ten or fewer volatile or semi-volatile organic regulated constituents.

Soil. For newly regulated soil, pre-treatment testing for all F039 constituents must be conducted to identify the number and concentration of constituents present. After treatment, the soil must be tested for those constituents initially determined to be present. Based on the TC survey, EPA estimates that the average wastestream will need to be tested for five constituents.

Debris. Newly regulated debris is the only debris affected by the rule and is not subject to any testing requirements. Generators can use their knowledge of the waste to determine the required treatment, and as long as the treatment is conducted properly, there is no testing required to demonstrate compliance.

Exhibit 3-2 presents the estimated incremental testing costs attributable to the Phase II LDR rule. In developing the estimates, EPA made several assumptions. For each test, EPA assumes that there is one waste sample and one QA/QC sample. For each test, EPA also assumes that a test for all F039 constituents is equivalent to a test for all the universal standard constituents, although there are some small differences between the two sets of constituents. EPA based testing costs on several sources including a March 4, 1993, letter from Texaco to the RCRA Docket TTCA, Emergency Rule Notice; an API letter to the RCRA Docket HWEP, for the HWIR proposed rule; and EPA's testing cost analysis done in support of the HWIP.

The Information Collection Request (ICR) for this rule, being prepared by EPA, estimates that the recordkeeping cost is $346 per wastestream. It is estimated to take one hour to develop and submit the required notification and one quarter of an hour to retain copies of the documentation and notification. EPA estimates that modifications to the waste analysis plan required under 40 CFR 268.7 may cost each facility an additional $350 in recordkeeping costs.

EXHIBIT 3-2

ESTIMATED INCREMENTAL TESTING COST FOR PHASE II LDR WASTES

Testing Requirement	Annualized Costs			
	Baseline Cost	Post Regulatory Cost		Incremental Cost
		Pre-treatment	Post-treatment	
TC Nonwastewater				
TCLP to Determine RCRA Status (every 4 years)	350[a]			
Comprehensive (F039) test to Determine All Constituents Present (every 4 years)		835[b]		
Total Constituent Analysis for 5 Constituents (4 wasteloads per year)			3,200[c]	
Incremental Cost				3,685
Phase 2 Newly Listed Wastes				
Generator Knowledge	0			
Generator Knowledge		0		
Total Constituent Analysis for 10 Volatile or Semi-volatile Organic Constituents (4 wasteloads per year)			5,600[d]	
Incremental Cost				5,600
Newly Regulated Hazardous Soil				
TCLP to Determine RCRA Status (one load per year)	1,400[a]			
Comprehensive (F039) test to Determine All Constituents Present (one load per year)		3,340[b]		
Total Constituent Analysis for 5 Constituents (one load per year)			1,200[c]	
Incremental Cost				3,140

a/ Single TCLP costs $700 (and would be doubled for one QA/QC sample) for all organics and two metals based on EPA's HWIP cost analysis.

b/ In a comment to the Emergency Rule notice, Texaco stated that a single test for all F039 constituents costs $1,670 (double for one QA/QC sample).

c/ Single test (double for one QA/QC sample) costs $400 for two inorganic and three organic constituents based on EPA's HWIP cost analysis.

d/ Single test (double for one QA/QC sample) costs $1,400, assuming the sample must be tested separately for volatiles and semi-volatiles based on EPA's HWIP cost analysis.

e/ Single test (double for one QA/QC sample) costs $600, assuming two inorganic and three organic constituents, based on soil testing costs submitted in a recent comment by API.

3.1.5 Previously Regulated Wastes Affected by UTS

EPA has identified one type of previously regulated wastes that may be affected by the UTS: cyanide-bearing wastes. For these wastes, the Phase II LDR rule may potentially result in a cost savings. The approaches used to estimate these savings are described below (also see the discussion in Chapter 2).

Cyanide-bearing wastes may be affected because the UTS for cyanide is higher (less stringent) than previous BDAT standards for some cyanide-bearing waste codes. EPA identified twelve waste codes that had existing treatment standards for cyanide that would be increased by over a factor of ten. EPA then used 1991 BRS data to determine which wastestreams carried one or more of these codes. For each wastestream, EPA applied engineering judgement to determine if the combined treatment standards for the wastestream would allow a less expensive treatment, i.e., stabilization, to take the place of the BDAT treatment, alkaline chlorination.

In addition, the new consistency provided by the UTS will help streamline the treatment and management of all RCRA waste. This streamlining can, in fact, result in significant cost savings. For example, one commenter, DOW Chemical Co., reported that the UTS will result in an annual savings of $366,000 for one of their plants because it will eliminate the need for campaign burning, i.e., processing an individual wastestream through an incinerator so as not to commingle residues.[3] This plant has a rotary kiln processing 15,000 tons per year; thus, the savings associated with the streamlining effect of UTS would be $24 per ton of waste incinerated. EPA examined all prior LDR rules and determined that 2.3 million tons of waste annually would require incineration. Thus the maximum potential savings associated with the streamlining effect of UTS could be as high as $55 million per year (2.3 million tons per year times $24 per ton). EPA further extrapolated this information to wastes undergoing physical/chemical treatment because EPA believes that these types of treatment may also be conducted in campaigns. EPA estimates that approximately 5 million tons per year of waste are treated by physical/chemical treatment. Because physical/chemical treatment costs are roughly one-third of incineration costs, EPA assumes the savings associated with the streamlining effect of UTS would be reduced proportionally (i.e., $8 per ton). Therefore, the maximum potential savings for wastes suitable for

[3]EPA notes that it received many comments suggesting the UTS would increase costs. In general, however, these commenters were assuming that the treatment of underlying constituents would be required for listed wastes. EPA believes this erroneous assumption was the basis of their estimate of increase cost.

physical/chemical treatment could be as high as $41 million per year (5.1 million tons per year times $8 per ton). Thus the total maximum potential savings would be $96 million per year. EPA realizes that this characterization of savings resulting from the streamlining effect of UTS is based on an analysis employing broad assumptions and therefore regards the estimate as the *maximum potential* savings. However, EPA believes that it is possible that there may be additional cost savings resulting from the streamlining due to factors such as reduced labor requirements or recordkeeping needs.

3.1.6 Previously Regulated Wastes Affected by Recycling Modifications

EPA has identified one type of previously regulated wastes that may be affected by the recycling modifications: K069 wastes. For these wastes, the Phase II LDR rule may potentially result in a cost savings. The approaches used to estimate these savings are described below (also see the discussion in Chapter 2).

EPA determined that K069 wastes (emission control dust from secondary lead smelting) would be affected by the Phase II provision redefining the recycling definition to allow recycling of secondary process wastes. To estimate the potential cost savings, EPA used 1991 BRS data to determine the quantities of K069 waste currently being managed under a variety of treatment technologies. EPA then used unit cost data for the treatment technologies to estimate the total treatment cost avoided by the Phase II rule.

3.1.7 Waste Minimization

As discussed in Section 2.3 of this RIA, EPA performed a separate waste minimization analysis for the Phase II Final Rule RIA. Using the TC Survey as its basis, the Agency performed a more detailed accounting of waste minimization, which also addressed the concerns in the proposed rule analysis. The characterization of wastes subject to minimization was discussed in Section 2.3. This section addresses the methodology used to assess the cost impacts of waste minimization.

The methodology for the waste minimization analysis follows six steps:

(1) Develop a profile of the industries affected by the Phase II rule that indicated plans for waste minimization in the 1992 TC Survey Database.

(2) From the industry profile, select industries to examine in the waste minimization analysis which would be representative of the TC waste universe.

(3) Make telephone data verification calls to facilities within the industries identified in Step 2.

(4) For the facilities participating in the verification, determine the cost components for the post-regulatory and waste minimization scenarios for all wastestreams.

(5) Estimate the total costs/cost savings for the waste minimization and the post-regulatory (i.e.: without waste minimization) scenarios.

(6) Extrapolate results to TC waste universe, and determine overall cost/cost savings as the difference between the post-regulatory and waste minimization scenarios.

The first three steps pertain to waste characterization and were discussed in detail in Section 2.3. The last three steps pertain to the cost impacts of waste minimization and are discussed in detail below.

Step 4. For the facilities participating in the verification, determine the cost components for the post-regulatory and waste minimization scenarios for all wastestreams. The costing methodology is designed to capture the true costs of waste minimization. The methodology addresses the capital investment costs, the operating costs, and maintenance costs associated with implementing waste minimization technologies and operating practices. If information on regulatory and legal/liability costs could be obtained from the data verification activity described above, such costs (and savings) would also be included in the cost calculations.

The first step in the developing the potential costs (and cost savings) for waste minimization activities was to identify the specific pollution prevention action that industry planned to employ. For example, several petroleum refiners indicated in the TC Survey that by dewatering tank bottoms (a D018 waste stream) and separating out sand/grit-type material, the resultant oils could be re-introduced to the feedstock for processing.

Based on the database analysis and verification phone contacts, the following waste minimization alternative actions were identified:

- Recycle of petroleum refinery oil storage tank bottoms;
- Reuse of petroleum refinery lime sludges as cement kiln feedstock; and
- Regeneration of spent catalysts.

After identifying these waste minimization activities, EPA developed conceptual engineering flowsheets to depict the action and identify potential costs for capital equipment and operation. The specific investment costs for each alternative were obtained and developed under the following categories:

- *Depreciable Capital Expenditures* - Equipment, Materials, Site Preparation, Installation, Engineering/Procurement.

- *Expenses* - Start-up, Permitting (if available), Salvage, Training (if appropriate), Working Capital, Disposal, Raw Materials, Utilities, Labor, Maintenance, Insurance.

- *Operating Revenues* - Eliminated Expenses, By-product Revenues.

- *Economic Factors* - Lifetime of Activity, Escalation Rate, Discount Rate.

In Exhibit 3-3, EPA present the basis for each of the above factors. An example worksheet for calculating the investment costs and savings are shown on Exhibit 3-4. The table

EXHIBIT 3-3

CALCULATION BASIS OF INVESTMENT COST FACTORS

Depreciable Capital Expenditure (DCE)

Equipment - Actual Vendor Costs or Cost Handbook Values
Materials - Actual Vendor Costs or Cost Handbook Values
Site Preparation - None - Mobile equipment
Installation - 5 percent of equipment and material costs
Engineering/Procurement - 2 percent of equipment and material costs

Expenses

Start-up - 5 percent of Depreciable Capital Equipment (DCE)
Permitting - 3 percent of DCE
Salvage - 20 percent of DCE
Training - $2,000 first year of operation
Working Capital - assumed included in other O&M cost factors
Disposal - Disposal Cost value; $75/ton for non-hazardous wastes or $1,200 for hazardous wastes
Raw Materials - Actual vendor/supplier costs
Utilities - $.25/KWHr
Labor - $25/Labor Hour required for operation
Maintenance - 2 percent of DCE
Insurance - $300/yr

Operating Revenues

Eliminated Expenses/Revenues - Amount of Materials/Costs Saved x actual current costs
By-Product Revenues - Actual income derived, based on current prices

Economic Factors

Lifetime of Activity - Expected equipment life of principal capital equipment
Escalation Rate - 4 percent
Discount Rate - 7.5 percent

EXHIBIT 3-4

SAMPLE WORKSHEET FOR CALCULATING POTENTIAL INVESTMENT COSTS

WORKSHEET 1

LEVEL 1 - INVESTMENT COSTS

5000 tons per year of tank bottoms
30 gpm decanter, 3 phase, SS, centifuge
Resulting solids non-hazardous

Depreciable Capital Expenditures	Cash Flow Estimate C	Lifetime n	Escalation Rate e	First Year of Cash Flow t	Occurance 0 = once 1 = repeat	Discount Rate d	p (1+e)/(1+d) m*	Present Value Factor PVF [p^t][(1-p^n)/(1-p)]^m	Present Value PV	Annualization Factor AF [d(1+d)^n]/[(1+d)^n-1]	Annualized Cash Flow (PV)(AF)
Equipment	$182,170.00	15	0.04	0	0	0.075	0.9674	1.0000	$182,170.00	0.1133	$20,637.54
Materials	$0.00	15	0.04	0	0	0.075	0.9674	1.0000	$0.00	0.1133	$0.00
Site preparation	$0.00	15	0.04	0	0	0.075	0.9674	1.0000	$0.00	0.1133	$0.00
Installation	$9,106.50	15	0.04	0	0	0.075	0.9674	1.0000	$9,106.50	0.1133	$1,031.88
Engineering/procurement	$3,643.40	15	0.04	0	0	0.075	0.9674	1.0000	$3,643.40	0.1133	$412.75
Sub-total	$194,921.90										$22,082.16
EXPENSES											
Start-up	$9,746.10	15	0.04	1	0	0.075	0.9674	0.9674	$9,428.78	0.1133	$1,068.16
Permitting	$5,847.66	15	0.04	1	0	0.075	0.9674	0.9674	$5,657.27	0.1133	$640.90
Salvage	($38,984.38)	15	0.04	15	0	0.075	0.9674	0.6087	($23,728.14)	0.1133	($2,688.10)
Training	$2,000.00	15	0.04	1	0	0.075	0.9674	0.9674	$1,934.88	0.1133	$219.20
Working capital	$0.00	15	0.04	1	1	0.075	0.9674	11.6285	$0.00	0.1133	$0.00
Disposal	$35,361.25	15	0.04	1	1	0.075	0.9674	11.6285	$411,429.33	0.1133	$46,609.69
Raw materials	$0.00	15	0.04	1	1	0.075	0.9674	11.6285	$0.00	0.1133	$0.00
Utilities	$3,668.67	15	0.04	1	1	0.075	0.9674	11.6285	$42,637.67	0.1133	$4,830.30
Labor	$3,333.33	15	0.04	1	1	0.075	0.9674	11.6285	$38,761.52	0.1133	$4,391.19
Maintenance	$3,898.44	15	0.04	1	1	0.075	0.9674	11.6285	$45,332.82	0.1133	$5,135.63
Insurance	$300.00	15	0.04	1	1	0.075	0.9674	11.6285	$3,488.54	0.1133	$395.21
Misc	$0.00	15	0.04	1	1	0.075	0.9674	11.6285	$0.00	0.1133	$0.00
Sub-total											$80,602.18
OPERATING REVENUES											
Revenues (recovered oil)	($155,800.00)	15	0.04	1	1	0.075	0.9674	11.6285	($1,811,713.55)	0.1133	($205,244.02)
By-product revenuse	0	15	0.04	1	1	0.075	0.9674	11.6285	$0.00	0.1133	$0.00
Sub-total	($155,800.00)										($205,244.02)

* m = a flag to make the PVF equation work for one-time or recurring costs
For "t", the year of construction is "zero" year

($122,559.68)

Tons of btms 5000
operating hrs - 5000 tons 666.67
Assume 60% water, 38% oil, 2% solids
Assume sp.gr. mix equals 1
Assume 90% oil-water efficiency, 85% solids efficency (actual more like 98.5 %)
volume water/ton of btms 142.7 gal
volume solids @30%/tbtms 15.2 gal
volume oil/ton of btms - gal 82
weight solids/ton btms - lbs 188.7
Cost of crude/gal $0.38
disposal/ton if hazardous $1,280.00
disposal/ton if non-hazardous $75.00
Labor @ $25/hr
operating labor @ 0.2 hrs per hour of operation
Assume solids non-hazardous
Assume 22kwh/hr of operation

shows that the Present Value and Annualized Cash Flow were calculated to quantify the investment costs and allow comparison of alternative approaches to meeting the Phase II Rule (i.e., invest in waste minimization techniques or simply treat the Phase II wastes by conventional end-of-pipe technologies).

Step 5. Estimate the total costs/cost savings for the waste minimization and the post-regulatory (i.e.: without waste minimization) scenarios. The net annualized waste minimization savings were calculated by summing the separate annualized waste minimization cash flows for each cost element, adjusting the annualized cost for tax liabilities, and subtracting the adjusted result from the post-regulatory compliance annualized costs (Exhibits 3-4 and 3-5). A 34 percent corporate tax rate was assumed and capital equipment was depreciated on a double-declining-balance method. Both the pre-tax and post-tax net annualized savings are discussed. Escalation rates of 4 percent and discount rates of 7.5 percent were used for all cost elements. The net present value was calculated by dividing the net annualized savings by an annualization factor that is a function of the discount rate and life of the project. The project life equals the life expectancy of the principle equipment item in the waste minimization alternative.

Worksheets for each level, cost summary and financial calculations were used to insure all costs are accounted for to the extent possible. Exhibit 3-5 presents an example worksheet for adjusting potential costs and cost savings for taxes.

Because tank bottom dewatering was performed at a number of facilities with significantly different wastestream volumes, EPA created a series of model plants and developed individual costs (normalized per ton of waste) for each model plant. The costs were then graphed to facilitate interpolation and extrapolation of potential costs and cost savings for actual plants. For example, a cost survey was developed for potential costs/cost savings for recycling of tank bottoms at petroleum refineries where the wastestream volume ranged from 35 tons per year up to 5,280 tons per year.

Step 6. Extrapolate results to TC waste universe, and determine overall cost/cost savings as the difference between the post-regulatory and waste minimization scenarios. The Agency calculated the annualized savings for each of the wastestreams, including extrapolating it

EXHIBIT 3-5

SAMPLE WORKSHEET FOR TAX ADJUSTMENT OF COSTS

WORKSHEET 4

SUMMARY - ANNUALIZED COSTS

5000 tons per year of tank bottoms
30 gpm decanter, 3 phase, SS, centifuge
Resulting solids non-hazardous

Cost Elements	Waste Minimization Alternative	Discount d	Dep Factor FD	Tax Rate	Tax Adjustment Minus	Adjusted Total
Depreciable Capital Expenses	$22,082.16	0.075	0.7784	0.34	$5,844.45	$16,237.72
Expenses	$60,602.18			0.34	$20,604.74	$39,997.44
Operating Revenues	($205,244.02)			0.34	($69,782.97)	($135,461.05)
Total	($122,559.68)				($43,333.78)	($79,225.90)
Tax Adjustment	($43,333.78)					
Tax Adusted Total	($79,225.90)					

to the CBI volumes. The waste volumes which were included in the waste minimization analysis made up 35% of the total on-site treated, non-CBI, non-wastewater, non-sporadically generated wastes. For CBI data, EPA used the "unit savings" calculated for the on-site treated, non-CBI, non-wastewater, non-sporadically generated wastes, and applied it to 35% percent of the total volume of CBI on-site treated, non-CBI, non-wastewater, non-sporadically generated wastes.

3.2 RESULTS OF THE COST ANALYSIS

Exhibit 3-6 summarizes the results of the cost analysis. *In total, the Phase II LDR rule would have an incremental annual cost of $191 to $219 million (representing accounting or not accounting for waste minimization savings).* Sixty-seven percent of this cost would be for the treatment of organic TC nonwastewater wastes, and 16 percent and 17 percent would be for the treatment of organic TC hazardous soil and debris. In addition, there may be a potential savings of $2 million, associated with previously regulated waste affected by UTS and modifications to the recycling definition. The cost savings associated with waste minimization is estimated to be $25 million. Finally, the streamlining effect of UTS on the treatment of previously regulated waste presents a savings ranging from $0 to $55 million for incinerable wastes and $0 to $41 million for wastes suitable for physical/chemical treatment.

3.2.1 Organic TC Wastes and Other Newly Regulated Wastes

As described above in Section 3.1.1., EPA conducted a facility-specific cost analysis for those facilities managing organic TC waste. Exhibit 3-7 shows a breakdown of results for all organic TC wastes, i.e., nonwastewater, soil, and debris. In Exhibit 3-7, there are estimates for testing and recordkeeping as well as for treatment; all costs were derived on facility-specific information. These facility-specific costs are presented in Exhibit 3-8. In addition, Exhibit 3-9 presents detailed information on waste characteristics and baseline and post-regulatory treatment costs. For each facility, this exhibit presents the waste quantity, the baseline and post-regulatory treatment technologies and unit costs, total baseline, post-regulatory, and incremental treatment costs, sorted by post-regulatory treatment technology and waste form. Summaries of costs by SIC code and state are also provided in Exhibits 3-10 and 3-11.

EXHIBIT 3-6

SUMMARY OF COSTS ASSOCIATED WITH THE PHASE II LDR PROPOSED RULE

Waste Type	Post-Regulatory Cost (million $/yr)	Baseline Cost (million $/yr)	Incremental Cost (million $/yr)
Newly Regulated Wastes			
Organic TC Wastes (D018- D043)			
Nonwastewaters	174	30	147
Soil	53	17	35
Debris	45	8	37
Chlorotoluenes	0.1	<0.1	<0.1
Waste Minimization Impacts	(25)	N/A	(25)
Subtotal for All Newly Regulated Wastes[a/]			
Without Waste Minimization	**272**	**56**	**219**
With Waste Minimization	**247**	**56**	**191**
Previously Regulated Wastes Affected by Rule			
K069 Recycling Wastes	0	0.6	(0.6)
Cyanide Wastes - UTS Savings	66.5	66.6	(0.1)

a/ Cost savings associated with waste minimization can be attributed to the Phase II rule when a facility, in facing increased waste management costs under Phase II, has an option that, while incurring incremental costs, can produce a positive financial return as compared to management under the Phase II cost structure. However, EPA does not have sufficient information to claim that all waste minimization investments are 100 percent attributable to the Phase II rule. To reflect this uncertainty, EPA presents the total cost of the rule both with and without the potential cost savings.

EXHIBIT 3-7
RESULTS FOR TC NONWASTEWATER, SOIL, AND DEBRIS

TC Nonwastewaters	
Number of Wastestreams	569
Quantity	167,000 tons/yr
Baseline Cost	$30 million/yr
Post-Regulatory Treatment Cost	$175 million/yr
Post-Regulatory Testing Cost	$2.1 million/yr
Incremental Cost	$147 million/yr
TC Soil	
Number of Wastestreams	266
Quantity	94,000 tons/yr
Baseline Cost	$17 million/yr
Post-Regulatory Treatment Cost	$52 million/year
Post-Regulatory Testing Cost	$0.8 million/year
Incremental Cost	$35 million/year
TC Debris	
Number of Wastestreams	569
Quantity	34,000 tons/yr
Baseline Cost	$8.1 million/yr
Post-Regulatory Treatment Cost	$45 million/yr
Post-Regulatory Testing Cost	$0
Incremental Cost	$37 million/yr
Total Number of Facilities	**47**
Total Rounded Quantity of Waste	**295,000 tons/yr**
Total Recordkeeping Cost	**$486,000/yr**

EXHIBIT 3-8
FACILITY-WIDE INFORMATION & COSTS

FACILITY	PRIMARY SIC CODE	ANNUAL INCREMENTAL COSTS			
		RECORDKEEPING	TESTING	TREATMENT	TOTAL
1	4953-REFUSE SYSTEMS	$10,038	$77,200	$21,936,131	$22,023,369
2	4953-REFUSE SYSTEMS	$1,385	$11,100	12,336,563	12,349,048
3	2911-PETROLEUM REFINING	$346	$3,700	12,710	16,756
4	4953-REFUSE SYSTEMS	$692	$7,400	1,080,702	1,088,794
5	2911-PETROLEUM REFINING	$1,038	$11,100	5,456,000	5,468,138
6	4953-REFUSE SYSTEMS	$33,229	$214,900	18,908,004	19,156,133
7	2911-PETROLEUM REFINING	$4,154	$33,300	1,909,239	1,946,693
8	4953-REFUSE SYSTEMS	$2,769	$24,700	732,870	760,339
9	2869-INDUS. ORG. CHEMICALS NEC	$346	$3,700	346,095	350,141
10	2869-INDUS. ORG. CHEMICALS NEC	$346	$3,700	390,195	394,241
11	2812-ALKALINES & CHLORINES	$346	$3,700	123,186	127,232
12	2911-PETROLEUM REFINING	$346	$3,700	554,400	558,446
13	2911-PETROLEUM REFINING	$346	$3,700	941,850	945,896
14	4953-REFUSE SYSTEMS	$6,923	$27,900	14,922,127	14,956,950
15	2911-PETROLEUM REFINING	$692	$7,400	63,549	71,641
16	2911-PETROLEUM REFINING	$346	$3,100	835,590	839,036
17	2869-INDUS. ORG. CHEMICALS NEC	$4,154	$22,900	785,050	812,104
18	2911-PETROLEUM REFINING	$346	$3,700	12,710	16,756
19	4953-REFUSE SYSTEMS	$11,076	$80,500	555,712	647,288
20	4953-REFUSE SYSTEMS	$11,076	$81,600	4,154,893	4,247,569
21	9511-WASTE MANAGEMENT	$16,615	$148,100	10,385,228	10,549,943
22	4953-REFUSE SYSTEMS	$2,077	$22,200	334,984	359,261
23	2821-PLASTICS MATERIALS AND RESIN	$346	$3,700	1,807,500	1,811,546
24	4953-REFUSE SYSTEMS	$20,422	$139,500	4,120,196	4,280,118
25	2911-PETROLEUM REFINING	$692	$6,800	886,772	894,264
26	2879-PESTICIDES & AGRIC. CHEM. NEC	$346	$3,700	681,720	685,766
27	2869-INDUS. ORG. CHEMICALS NEC	$346	$3,100	481	3,927
28	2911-PETROLEUM REFINING	$692	$6,800	12,542,200	12,549,692
29	2911-PETROLEUM REFINING	$346	$3,700	941,850	945,896
30	2812-ALKALINES & CHLORINES	$4,846	$28,500	131,481	164,827
31	2869-INDUS. ORG. CHEMICALS NEC	$5,538	$21,700	197,040	224,278
32	2911-PETROLEUM REFINING	$346	$3,700	1,183,260	1,187,306
33	2869-INDUS. ORG. CHEMICALS NEC	$2,077	$9,900	1,120,480	1,132,457
34	2869-INDUS. ORG. CHEMICALS NEC	$692	$6,800	46,792	54,284
35	2911-PETROLEUM REFINING	$1,385	$14,200	1,535,624	1,551,209
36	2911-PETROLEUM REFINING	$346	$3,700	149,500	153,546
37	4953-REFUSE SYSTEMS	$15,922	$126,700	14,818,717	14,961,339
38	2911-PETROLEUM REFINING	$1,038	$10,500	4,620,614	4,632,152
39	2911-PETROLEUM REFINING	$346	$3,700	747,500	751,546
CBI (8 Fac.)	CBI	$321,564	$1,733,900	73,406,283	75,461,747
		==========	======	========	========
	TOTALS	$485,981	$2,929,900	$215,715,798	$219,131,679

FACILITY 1

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
DEBRIS	7	D018, D026, D027, & OTHERS	10,010	LANDFILLING -- OFF-SITE	$251	$2,510,108	AVERAGE COST USED *	$1,281	$12,826,824	$10,316,716
NONWASTEWATER	15	D018, D019, D021, & OTHERS	4,765	LANDFILLING -- OFF-SITE	$251	$926,134	AVERAGE COST USED *	$1,053	$5,015,970	$4,089,836
SOIL	7	D018, D026, D027, & OTHERS	24,690	LANDFILLING -- OFF-SITE	$251	$6,191,264	AVERAGE COST USED *	$556	$13,720,843	$7,529,579
	29		39,465			$9,627,506			$31,563,637	$21,936,131

FACILITY 2

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
DEBRIS	1	D043	17	LANDFILLING -- OFF-SITE	$251	$4,263	AVERAGE COST USED *	$1,281	$21,784	$17,521
NONWASTEWATER	1	D043	13,881	LANDFILLING -- OFF-SITE	$251	$3,480,800	INCINERATION - SLUDGES/SOLIDS	$1,135	$15,754,935	$12,274,135
NONWASTEWATER	1	D018	56	LANDFILLING -- OFF-SITE	$251	$14,043	AVERAGE COST USED *	$1,053	$58,949	$44,907
	3		13,954			$3,499,105			$15,835,668	$12,336,563

FACILITY 3

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	1	D018	13	LANDFILLING	$75	$975	AVERAGE COST USED *	$1,053	$13,685	$12,710

FACILITY 4

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	1	D018	1,050	LANDFILLING -- OFF-SITE	$251	$263,298	INCINERATION - SLUDGES/SOLIDS	$1,280	$1,344,000	$1,080,702

FACILITY 5

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	2	D018	6,000	LANDFILLING	$75	$450,000	THERMAL DESORPTION -- OFF-SITE	$515	$3,090,000	$2,640,000
NONWASTEWATER	1	D018	6,400	LANDFILLING -- ON-SITE	$75	$480,000	THERMAL DESORPTION	$515	$3,296,000	$2,816,000
	3		12,400			$930,000			$6,386,000	$5,456,000

FACILITY 6

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
DEBRIS	1	D026	27	LANDFILLING -- OFF-SITE	$251	$6,771	EXTRACTION (OFF-SITE)	$390	$10,530	$3,759
DEBRIS	4	D018, D026, & D040	2,094	LANDFILLING -- OFF-SITE	$251	$525,091	INCINERATION	$2,110	$3,995,580	$3,470,489
DEBRIS	1	D040	56	LANDFILLING -- OFF-SITE	$251	$14,043	INCIN + STABILIZATION (25%)	$1,858	$104,020	$89,977
DEBRIS	9	D018, D023, D025, & OTHERS	120	LANDFILLING -- OFF-SITE	$251	$30,091	AVERAGE COST USED *	$1,281	$153,768	$123,677
NONWASTEWATER	4	D026, D029, D040	2,990	LANDFILLING -- OFF-SITE	$251	$749,772	THERMAL DESORPTION -- OFF-SITE	$515	$1,539,850	$790,078
NONWASTEWATER	5	D018, D021, D022, & OTHERS	8,247	LANDFILLING -- OFF-SITE	$251	$2,068,018	INCINERATION - SLUDGES/SOLIDS	$1,280	$10,556,160	$8,488,142
NONWASTEWATER	6	D018, D019, D032, & OTHERS	4,733	LANDFILLING -- OFF-SITE	$251	$1,569,427	INCIN (SOLID) + STABILIZATION (10%)	$1,302	$6,494,416	$4,924,989
NONWASTEWATER	12	D020, D021, D023, & OTHERS	393	LANDFILLING -- OFF-SITE	$251	$98,549	AVERAGE COST USED *	$1,053	$413,699	$315,150
SOIL	1	D018	1,733	LANDFILLING -- OFF-SITE	$251	$434,567	THERMAL DESORPTION	$515	$892,495	$457,928
SOIL	1	D018	290	THERMAL DESORPTION	$515	$149,350	DESORPTION -- OFF-SITE + STABILIZATION (	$765	$221,850	$72,500
SOIL	1	D040	123	LANDFILLING -- OFF-SITE	$251	$30,843	INCINERATION	$1,470	$180,810	$149,967
SOIL	4	D018, D019, D026, & OTHERS	70	LANDFILLING -- OFF-SITE	$251	$17,553	AVERAGE COST USED *	$556	$38,901	$21,348
	49		20,876			$5,694,075			$24,602,079	$18,908,004

FACILITY 7

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
DEBRIS	2	D018, & D038	332	LANDFILLING -- ON-SITE	$75	$24,900	EXTRACTION (OFF-SITE)	$390	$129,480	$104,580
NONWASTEWATER	1	D018	1,466	LANDFILLING -- ON-SITE	$75	$109,950	INCINERATION - SLUDGES/SOLIDS	$1,280	$1,876,480	$1,766,530
NONWASTEWATER	1	D038	39	LANDFILLING -- ON-SITE	$75	$2,925	AVERAGE COST USED *	$1,053	$41,054	$38,129
	4		1,837			$137,775			$2,047,014	$1,909,239

FACILITY 8

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
DEBRIS	1	D018	1	LANDFILLING -- ON-SITE	$75	$75	AVERAGE COST USED *	$1,281	$1,281	$1,206
NONWASTEWATER	1	D028	298	LANDFILLING -- ON-SITE	$75	$22,350	INCIN (SOLID) + STABILIZATION (10%)	$1,592	$474,416	$452,066
NONWASTEWATER	5	D018, D019, D022, & OTHERS	285	LANDFILLING -- ON-SITE	$75	$21,375	AVERAGE COST USED *	$1,053	$300,011	$278,636
SOIL	1	D018	2	LANDFILLING -- ON-SITE	$75	$150	AVERAGE COST USED *	$556	$1,111	$961
	8		586			$43,950			$776,820	$732,870

FACILITY 9

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	2	D018, & D028	354	LANDFILLING	$75	$26,550	AVERAGE COST USED *	$1,053	$372,645	$346,095

FACILITY 10

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	3	D018, D022, & D028	261	LANDFILLING	$75	$19,575	INCINERATION - SLUDGES/SOLIDS	$1,570	$409,770	$390,195

FACILITY 11

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	7	D018, D022, D028, & OTHERS	126	LANDFILLING	$75	$9,450	AVERAGE COST USED *	$1,053	$132,636	$123,186

* AVERAGE COST WAS USED WHEN (1) WASTE STREAM VOLUME IS BELOW CUT-OFF VALUE BASED ON 95 PERCENT OF TOTAL QUANTITY OF PHYSICAL FORM; OR (2) WHEN AVAILABLE INFORMATION WAS INSUFFICIENT TO MAKE TREATMENT ASSIGNMENT.

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	1	D018	1,260	LANDFILLING	$75	[illegible],500	THERMAL DESORPTION -- OFF-SITE	$515	$648,900	$554,400

FACILITY 13

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	1	D018	630	LANDFILLING	$75	$47,250	INCINERATION - SLUDGES/SOLIDS	$1,570	$989,100	$941,850

FACILITY 14

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
DEBRIS	1	D018	1,511	LANDFILLING -- OFF-SITE	$251	$378,898	THERMAL DESORPTION (OFF-SITE)	$55	$83,105	$-295,793
DEBRIS	4	D018, D021, D027, & OTHERS	9,185	LANDFILLING -- OFF-SITE	$251	$2,303,231	INCINERATION	$2,110	$14,317,760	$12,014,529
DEBRIS	46	D019, D021, D022, & OTHERS	240	LANDFILLING -- OFF-SITE	$251	$60,182	AVERAGE COST USED *	$1,281	$307,536	$247,354
SOIL	7	D018, D021, D027, & OTHERS	10,798	LANDFILLING -- OFF-SITE	$251	$2,707,706	THERMAL DESORPTION	$515	$5,560,970	$2,853,264
SOIL	17	D019, D022, D023, & OTHERS	337	LANDFILLING -- OFF-SITE	$251	$84,506	AVERAGE COST USED *	$556	$187,279	$102,773
	75		22,071			$5,534,524			$20,456,650	$14,922,127

FACILITY 15

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	2	D018	65	LAND TREATMENT	$75	$4,875	AVERAGE COST USED *	$1,053	$68,424	$63,549

FACILITY 16

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
SOIL	1	D018	1,211	LAND TREATMENT	$75	$90,825	DESORPTION -- OFF-SITE + STABILIZATION (	$765	$926,415	$835,590

FACILITY 17

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
DEBRIS	4	D030, D036	443	LANDFILLING -- ON-SITE	$75	$33,225	THERMAL DESORPTION (OFF-SITE)	$55	$24,365	$-8,860
DEBRIS	2	D028, & D039	55	LANDFILLING -- ON-SITE	$75	$4,125	INCINERATION	$2,110	$116,050	$111,925
NONWASTEWATER	1	D036	5	LANDFILLING -- ON-SITE	$75	$375	THERMAL DESORPTION	$515	$2,575	$2,200
NONWASTEWATER	3	D019, D039, & D040	15	LANDFILLING -- ON-SITE	$75	$1,125	INCINERATION - SLUDGES/SOLIDS	$1,570	$23,550	$22,425
SOIL	6	D029, D030, D036, & OTHERS	1,494	LANDFILLING -- ON-SITE	$75	$112,050	THERMAL DESORPTION	$515	$769,410	$657,360
	16		2,012			$150,900			$935,950	$785,050

FACILITY 18

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	1	D018	13	LANDFILLING	$75	$975	AVERAGE COST USED *	$1,053	$13,685	$12,710

FACILITY 19

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
DEBRIS	8	D018, D020, D027, & OTHERS	49	LANDFILLING -- OFF-SITE	$251	$12,287	AVERAGE COST USED *	$1,281	$62,789	$50,501
NONWASTEWATER	1	D035	124	LANDFILLING -- OFF-SITE	$251	$31,094	INCINERATION - SLUDGES/SOLIDS	$1,670	$194,680	$163,586
NONWASTEWATER	4	D018, D032, D039, & OTHERS	52	LANDFILLING -- OFF-SITE	$251	$13,040	AVERAGE COST USED *	$1,053	$54,739	$41,699
SOIL	1	D018	281	LANDFILLING -- OFF-SITE	$251	$70,464	THERMAL DESORPTION	$515	$144,715	$74,251
SOIL	15	D019, D021, D022, & OTHERS	740	LANDFILLING -- OFF-SITE	$251	$185,562	AVERAGE COST USED *	$556	$411,236	$225,674
	27		1,246			$312,447			$868,159	$555,712

FACILITY 20

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
DEBRIS	1	D018	239	LANDFILLING -- OFF-SITE	$251	$59,932	DESORPTION + STABILIZATION (100%)	$605	$144,595	$84,663
DEBRIS	4	D027, D030, D039, & OTHERS	49	LANDFILLING -- OFF-SITE	$251	$12,287	AVERAGE COST USED *	$1,281	$62,789	$50,501
NONWASTEWATER	1	D018	284	LANDFILLING -- OFF-SITE	$251	$71,216	THERMAL DESORPTION -- OFF-SITE	$515	$146,260	$75,044
NONWASTEWATER	23	D018, D019, D020, & OTHERS	2,595	LANDFILLING -- OFF-SITE	$251	$650,722	INCIN (SOLID) + STABILIZATION (10%)	$1,592	$4,131,240	$3,480,518
NONWASTEWATER	4	D030, D039, & D040	26	LANDFILLING -- OFF-SITE	$251	$6,520	AVERAGE COST USED *	$1,053	$27,369	$20,850
SOIL	1	D018	852	LANDFILLING -- OFF-SITE	$251	$213,648	DESORPTION -- OFF-SITE + STABILIZATION (	$765	$651,780	$438,132
SOIL	4	D018, D029, D039, & OTHERS	17	LANDFILLING -- OFF-SITE	$251	$4,263	AVERAGE COST USED *	$556	$9,447	$5,184
	38		4,062			$1,018,587			$5,173,480	$4,154,893

FACILITY 21

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
DEBRIS	1	D018	28	LANDFILLING -- OFF-SITE	$251	$7,021	INCINERATION	$2,110	$59,080	$52,059
DEBRIS	12	D019, D022, D028, & OTHERS	83	LANDFILLING -- OFF-SITE	$251	$20,813	AVERAGE COST USED *	$1,281	$106,356	$85,543
NONWASTEWATER	7	D019, D023, D024, & OTHERS	9,462	LANDFILLING -- OFF-SITE	$251	$2,372,691	INCINERATION - SLUDGES/SOLIDS	$1,570	$12,497,350	$10,124,659
NONWASTEWATER	7	D027, D028, D032, & OTHERS	48	LANDFILLING -- OFF-SITE	$251	$12,036	AVERAGE COST USED *	$1,053	$50,528	$38,492
SOIL	14	D018, D019, D020, & OTHERS	277	LANDFILLING -- OFF-SITE	$251	$69,461	AVERAGE COST USED *	$556	$153,936	$84,475
	41		9,898			$2,482,022			$12,867,250	$10,385,228

FACILITY 22

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	1	D018	229	LANDFILLING -- OFF-SITE	$251	$57,424	INCINERATION - SLUDGES/SOLIDS	$1,570	$359,530	$302,106
NONWASTEWATER	1	D035	41	LANDFILLING -- OFF-SITE	$251	$10,281	AVERAGE COST USED *	$1,053	$43,159	$32,878
	2		270			$67,705			$402,689	$334,984

* AVERAGE COST WAS USED WHEN (1) WASTE STREAM VOLUME IS BELOW CUT-OFF VALUE BASED ON 95 PERCENT OF TOTAL QUANTITY OF PHYSICAL FORM; OR (2) WHEN AVAILABLE INFORMATION WAS INSUFFICIENT TO MAKE TREATMENT ASSIGNMENT.

FACILITY 23

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	1	D043	1,500	LANDFILLING	$75	$112,500	INCINERATION - SLUDGES/SOLIDS	$1,280	$1,920,000	$1,807,500

FACILITY 24

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
DEBRIS	1	D021	28	LANDFILLING -- OFF-SITE	$251	$7,021	EXTRACTION (OFF-SITE)	$390	$10,920	$3,899
DEBRIS	9	D018, D026, D028, & OTHERS	731	LANDFILLING -- OFF-SITE	$251	$183,306	INCINERATION	$2,110	$1,542,410	$1,359,104
DEBRIS	27	D019, D020, D022, & OTHERS	335	LANDFILLING -- OFF-SITE	$251	$84,005	AVERAGE COST USED *	$1,281	$429,269	$345,265
NONWASTEWATER	1	D029	111	LANDFILLING -- OFF-SITE	$251	$27,834	INCINERATION - SLUDGES/SOLIDS	$1,570	$174,270	$146,436
NONWASTEWATER	1	D018	1,762	LANDFILLING -- OFF-SITE	$251	$441,839	INCIN (SOLID) + STABILIZATION (10%)	$1,302	$2,294,124	$1,852,285
NONWASTEWATER	18	D019, D020, D021, & OTHERS	388	LANDFILLING -- OFF-SITE	$251	$97,295	AVERAGE COST USED *	$1,053	$408,436	$311,141
SOIL	2	D039, & D040	242	LANDFILLING -- OFF-SITE	$251	$60,684	THERMAL DESORPTION	$515	$124,630	$63,946
SOIL	5	D018, D020, D031, & OTHERS	125	LANDFILLING -- OFF-SITE	$251	$31,345	AVERAGE COST USED *	$556	$69,466	$38,121
	64		3,722			$933,329			$5,053,525	$4,120,196

FACILITY 25

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	1	D018	35	LAND TREATMENT	$75	$2,625	AVERAGE COST USED *	$1,053	$36,843	$34,218
SOIL	1	D018	562	LAND TREATMENT	$75	$42,150	INCIN (SOLID) + STABILIZATION (10%)	$1,592	$894,704	$852,554
	2		597			$44,775			$931,547	$886,772

FACILITY 26

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	2	D019, & D032	454	LANDFILLING	$75	$34,200	INCINERATION - SLUDGES/SOLIDS	$1,570	$715,920	$681,720

FACILITY 27

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
SOIL	1	D018	1	LANDFILLING -- ON-SITE	$75	$75	AVERAGE COST USED *	$556	$556	$481

FACILITY 28

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	1	D018	5,258	LAND TREATMENT	$75	$394,350	THERMAL DESORPTION -- OFF-SITE	$515	$2,707,870	$2,313,520
SOIL	1	D018	23,247	LAND TREATMENT	$75	$1,743,525	THERMAL DESORPTION	$515	$11,972,205	$10,228,680
	2		28,505			$2,137,875			$14,680,075	$12,542,200

FACILITY 29

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	1	D018	630	SURFACE IMPOUNDMENT	$75	$47,250	INCINERATION - SLUDGES/SOLIDS	$1,570	$989,100	$941,850

FACILITY 30

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
DEBRIS	2	D018, & D022	175	LANDFILLING -- ON-SITE	$75	$13,125	THERMAL DESORPTION (ON-SITE)	$55	$9,625	$-3,500
SOIL	6	D018, D019, D029, & OTHERS	243	LANDFILLING -- ON-SITE	$75	$19,725	AVERAGE COST USED *	$556	$146,156	$126,431
SOIL	1	D028	342	LANDFILLING -- ON-SITE	$75	$25,650	THERMAL DESORPTION (ON-SITE)	$100	$34,200	$8,550
	9		780			$58,500			$189,981	$131,481

FACILITY 31

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
DEBRIS	16	D018, D019, D021, & OTHERS	312	LANDFILLING -- ON-SITE	$75	$23,400	THERMAL DESORPTION (OFF-SITE)	$55	$17,160	$-6,240
SOIL	12	D018, D019, D021, & OTHERS	462	LANDFILLING -- ON-SITE	$75	$34,650	THERMAL DESORPTION	$515	$237,930	$203,280
	28		774			$58,050			$255,090	$197,040

FACILITY 32

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	1	D018	780	LAND TREATMENT	$75	$58,500	INCIN (SOLID) + STABILIZATION (10%)	$1,592	$1,241,760	$1,183,260

FACILITY 33

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
DEBRIS	1	D018	472	LANDFILLING -- ON-SITE	$75	$35,400	EXTRACTION (OFF-SITE)	$390	$184,080	$148,680
NONWASTEWATER	1	D018	600	LANDFILLING -- ON-SITE	$75	$45,000	INCINERATION - SLUDGES/SOLIDS	$1,570	$942,000	$897,000
SOIL	1	D018	170	LANDFILLING -- ON-SITE	$75	$12,750	THERMAL DESORPTION	$515	$87,550	$74,800
	3		1,242			$93,150			$1,213,630	$1,120,480

* AVERAGE COST WAS USED WHEN (1) WASTE STREAM VOLUME IS BELOW CUT-OFF VALUE BASED ON 95 PERCENT OF TOTAL QUANTITY OF PHYSICAL FORM; OR (2) WHEN AVAILABLE INFORMATION WAS INSUFFICIENT

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	1	D010	10	LANDFILLING -- ON-SITE	$75	$750	AVERAGE COST USED *	$1,053	$10,527	$9,777
SOIL	1	D010	77	LANDFILLING -- ON-SITE	$75	$5,775	AVERAGE COST USED *	$556	$42,791	$37,016
	2		87			$6,525			$53,317	$46,792

FACILITY 35

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	1	D010	1,000	LANDFILLING	$75	$75,000	INCINERATION - SLUDGES/SOLIDS	$1,570	$1,570,000	$1,495,000
NONWASTEWATER	2	D010	15	LAND TREATMENT	$75	$1,125	AVERAGE COST USED *	$1,053	$15,790	$14,665
SOIL	1	D010	54	LAND TREATMENT	$75	$4,050	AVERAGE COST USED *	$556	$30,009	$25,959
	4		1,069			$80,175			$1,615,799	$1,535,624

FACILITY 36

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	1	D010	100	LANDFILLING	$75	$7,500	INCINERATION - SLUDGES/SOLIDS	$1,570	$157,000	$149,500

FACILITY 37

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
DEBRIS	1	D035	49	LANDFILLING -- ON-SITE	$75	$3,675	DESORPTION + STABILIZATION (100%)	$605	$29,645	$25,970
DEBRIS	4	D010, D020, & D040	255	LANDFILLING -- ON-SITE	$75	$19,125	INCINERATION	$2,110	$538,050	$518,925
NONWASTEWATER	1	D010	19,454	LANDFILLING -- ON-SITE	$75	$1,459,050	THERMAL DESORPTION -- OFF-SITE	$515	$10,018,810	$8,559,760
NONWASTEWATER	1	D010	2,324	LANDFILLING -- ON-SITE	$75	$174,300	INCINERATION - SLUDGES/SOLIDS	$1,280	$2,974,720	$2,800,420
NONWASTEWATER	3	D020, & D039	36	LANDFILLING -- ON-SITE	$75	$2,700	AVERAGE COST USED *	$1,053	$37,896	$35,196
SOIL	3	D010, & D020	6,472	LANDFILLING -- ON-SITE	$75	$485,400	THERMAL DESORPTION	$515	$3,333,080	$2,847,680
SOIL	3	D039, D040, & D043	64	LANDFILLING -- ON-SITE	$75	$4,800	AVERAGE COST USED *	$556	$35,566	$30,766
	16		28,654			$2,149,050			$16,967,767	$14,818,717

FACILITY 38

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	1	D010	3,520	LANDFILLING	$75	$264,000	INCINERATION - SLUDGES/SOLIDS	$1,280	$4,505,600	$4,241,600
NONWASTEWATER	1	D010	234	LAND TREATMENT	$75	$17,550	INCIN (SOLID) + STABILIZATION (10%)	$1,592	$372,528	$354,978
SOIL	1	D010	50	LAND TREATMENT	$75	$3,750	AVERAGE COST USED *	$556	$27,786	$24,036
	3		3,804			$285,300			$4,905,914	$4,620,614

FACILITY 39

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
NONWASTEWATER	1	D010	500	LAND TREATMENT	$75	$37,500	INCINERATION - SLUDGES/SOLIDS	$1,570	$785,000	$747,500

ALL CBI FACILITIES

FORM OF WASTE	NUMBER OF WASTESTREAM GROUPS	WASTE CODES	QUANTITY GENERATED IN 1995 (TONS)	BASELINE MANAGEMENT METHOD	BASELINE UNIT COST	BASELINE TOTAL MANAGEMENT COST	TREATMENT TECHNOLOGY	POST-REG UNIT COST	POST-REG TOTAL MANAGEMENT COST	ANNUAL INCREMENTAL COST
DEBRIS	4	D010, D020, & D038	2,189	LANDFILLING -- OFF-SITE	$251	$548,814	DESORPTION + STABILIZATION (100%)	$605	$1,324,345	$775,631
DEBRIS	1	D037	108	LANDFILLING -- OFF-SITE	$251	$27,082	DESORPTION -- OFF-SITE + STABILIZATION (	$765	$82,620	$55,538
DEBRIS	1	D026	614	LANDFILLING -- OFF-SITE	$251	$153,967	INCINERATION	$2,110	$1,295,540	$1,141,573
DEBRIS	3	D010, D039, & D040	353	LANDFILLING -- OFF-SITE	$251	$88,518	INCIN + STABILIZATION (25%)	$1,958	$655,698	$567,179
DEBRIS	28	D010, D019, D022, & OTHERS	4,306	LANDFILLING -- ON-SITE	$75	$943,031	AVERAGE COST USED *	$1,281	$5,517,712	$4,574,681
NONWASTEWATER	1	D010	219	LANDFILLING -- OFF-SITE	$251	$54,916	THERMAL DESORPTION -- OFF-SITE	$515	$112,785	$57,869
NONWASTEWATER	1	D010	344	LANDFILLING	$75	$25,800	THERMAL DESORPTION	$515	$177,160	$151,360
NONWASTEWATER	1	D010	631	LAND TREATMENT	$75	$47,325	INCINERATION - SLUDGES/SOLIDS	$1,570	$990,670	$943,345
NONWASTEWATER	27	D010, D019, D020, & OTHERS	28,627	LANDFILLING -- OFF-SITE	$251	$7,170,507	INCIN (SOLID) + STABILIZATION (10%)	$1,592	$38,242,114	$31,063,607
NONWASTEWATER	111	D010, D019, D020, & OTHERS	31,521	LANDFILLING -- OFF-SITE	$251	$5,962,058	AVERAGE COST USED *	$1,053	$33,181,195	$27,219,137
LIQUID NONWASTEWATER	1	D026	154	LANDFILLING -- OFF-SITE	$251	$38,617	THERMAL DESORPTION -- OFF-SITE	$515	$79,310	$40,693
LIQUID NONWASTEWATER	1	D019	110	LANDFILLING -- OFF-SITE	$251	$27,584	INCIN (SOLID) + STABILIZATION (10%)	$1,592	$175,120	$147,536
LIQUID NONWASTEWATER	1	D010	10	LANDFILLING -- OFF-SITE	$251	$2,508	AVERAGE COST USED *	$1,053	$10,527	$8,019
SOIL	4	D010, D020, D039	2,353	LANDFILLING -- OFF-SITE	$251	$590,038	DESORPTION -- OFF-SITE + STABILIZATION (	$765	$1,800,045	$1,210,007
SOIL	1	D040	294	LANDFILLING -- OFF-SITE	$251	$73,723	INCIN (SOLID) + STABILIZATION (10%)	$1,592	$468,048	$394,325
SOIL	1	D022	35	LANDFILLING -- OFF-SITE	$251	$8,777	AVERAGE COST USED *	$1,053	$36,843	$28,067
SOIL	58	D010, D019, D020, & OTHERS	15,080	LANDFILLING -- OFF-SITE	$251	$3,796,994	AVERAGE COST USED *	$556	$8,824,909	$5,027,915
	253		87,748			$19,560,358			$92,974,641	$73,406,283
GRAND TOTAL	711		294,609			$55,769,482			$271,485,280	$215,715,798

* AVERAGE COST WAS USED WHEN (1) WASTE STREAM VOLUME IS BELOW CUT-OFF VALUE BASED ON 95 PERCENT OF TOTAL QUANTITY OF PHYSICAL FORM; OR (2) WHEN AVAILABLE INFORMATION WAS INSUFFICIENT TO MAKE TREATMENT ASSIGNMENT.

EXHIBIT 3-10
SUMMARY OF COSTS BY SIC

SIC CODE	DESCRIPTION	PERCENTAGE OF TOTAL COST
4953	Refuse Systems	43 %
2911	Petroleum Refining	15 %
9511	Waste Management	5 %
CBI	Mostly Refuse Systems	34 %
All others	Pesticides, Chemicals, and Plastics	3 %

EXHIBIT 3-11
SUMMARY OF COSTS BY STATE

STATE	PERCENTAGE OF TOTAL COST
Texas	18 %
California	10 %
Illinois	9 %
Indiana	9 %
Michigan	7 %
Oklahoma	5 %
All other states	8 %
CBI	34 %

Since EPA believes no coke by-product wastes will be landfilled as a result of the coke by-product listing rule (August 18, 1992, at 57 FR 37284), EPA estimates that no costs will be associated with the treatment standards for coke production wastes. The incremental cost for chlorinated toluenes is estimated to be less than $0.1 million annually.

The unit cost for the treatment of TC nonwastewaters averages $1,050 per ton. (The average baseline cost is $30 million/year divided by 167,000 tons/year = $180/ton)[4]. For TC hazardous soils and debris, the unit treatment costs average $560 and $1,300 per ton, respectively.

While the total incremental cost for the 47 facilities in the cost analysis is $219 million, the average cost per facility differs substantially between captive (i.e., non-commercial) and commercial facilities. For the non-CBI captive facilities, the average incremental compliance cost for captive facilities is $1.4 million. (The range is from $4,000 to $13 million, with a standard deviation of $2.5 million.) For the non-CBI commercial facilities, the average incremental compliance cost is $8.8 million. (The range is from $300,000 to $22 million, with a standard deviation of $7.7 million).

The significance of the distinction drawn here relates primarily to the possible economic impacts caused by the costs incurred. For the captive facilities, the potential for pass through of costs is determined by the structure of the markets for the products associated with the generation of the wastes affected by the Phase II LDR rule. There would be large variation in elasticity, which determines the degree to which cost pass through is possible. For commercial firms, the primary market is for the waste management service. The elasticity of demand for waste management services might be expected to be more consistent across commercial facilities.

3.2.2 Previously Regulated Wastes Affected by UTS and Recycling Modifications

As described in Sections 3.1.5 and 3.1.6, EPA estimated cost savings associated with less stringent treatment standards for some cyanide-bearing wastes and avoided treatment costs for K069 wastes due to the recycling definition. Wastestream-specific data for cyanide wastes is presented in Exhibit 3-12. As this exhibit shows, the baseline treatment cost for these wastes is $66.6 million, and the post-regulatory cost is $66.5 million. In other words, an incremental savings

[4] This compares well with EPA's estimated compliance cost of the TC identification rule, which estimated an incremental compliance cost of $160/ton, in 1992 dollars. From U.S. EPA Background document Toxicity Characteristic Regulatory Impact Analysis, Final Report, March 1990.

EXHIBIT 3-12
ANALYSIS OF CYANIDE WASTESTREAMS POTENTIALLY AFFECTED BY THE UTS

WASTESTREAM WASTE CODE(S)	QUANTITY REPORTED IN 1991 BRS (TONS)	AFFECTED BY UTS LEVEL*	BASELINE COSTS	POST-REG. COSTS	INCR. COSTS
F006 F007 F008 F009 F011	172,784	N	$51,835,200	$51,835,200	$0
D001 D002 D003 D004 D007 K011 K013 P003 P016 P030 P063 P098 P101 P105 P106 U001 U002 U003 U004 U008	19,040	N	$5,712,000	$5,712,000	$0
F001 F002 F005 F008 F011	15,509	N	$4,652,700	$4,652,700	$0
D001 D002 D003 D004 D008 D009 D010 D011 D012 D018 K001 K037 K045 K048 K049 K051 P012 P016 P030 P041 U048 U056 U088 U098 U112	3,399	N	$1,019,700	$1,019,700	$0
D001 D002 D003 D004 D005 D006 D007 D008 D009 D010 D011 D039 F001 F002 F003 F004 F005 F006 F007 F008 F009 F011 F019 P005 P022	2,095	N	$628,500	$628,500	$0
D001 D002 D003 D004 D005 D006 D007 D008 D009 D010 D040 D043 F001 F003 F008 F011 F019 F037 K011 K013 K090 K094 P065 P070 U050	1,992	N	$597,600	$597,600	$0
D001 D003 D018 D038 F039 K011 K013 K014 P063 U002 U009	1,495	N	$448,500	$448,500	$0
F002 F003 F004 F005 P063 U002 U012 U036 U044 U131 U154 U239	904	N	$271,200	$271,200	$0
D001 D002 D003 D004 D005 F032 K008 K010 K064 K117 K123 K124 K126 K131 P074 P106 P123 U002 U006 U024 U035 U058 U200 U201 U202	809	N	$242,700	$242,700	$0
D007 K011 K013 P063 U002 U003 U009	738	N	$221,400	$221,400	$0
D001 D004 D005 D006 D007 D008 D009 D010 D011 D018 D019 D020 D021 D022 F001 F002 F003 F004 F005 F006 F007 P022 P030 U080 U122	641	N	$192,300	$192,300	$0
P106	530	Y	$159,000	$116,600	($42,400)
F006 F012	419	Y	$125,700	$92,180	($33,520)
D003 D004 D005 D006 D007 D008 D011 F002 F006 F007 F008 F009 F011 F012 F019 P011 P021 P029 P030 P074 P104 P106 P121 U061	296	N	$88,800	$88,800	$0
D001 D002 D007 D009 F001 F002 F003 F004 F005 F039 P106 P120 U002 U019 U052 U056 U080 U122 U154 U159 U161 U196 U211 U220	229	N	$68,700	$68,700	$0
F001 F002 F003 F004 F005 F006 F007 F012 F019	203	N	$60,900	$60,900	$0
D006 F001 F002 F003 F005 F006 F007 F008 F009 F019 K062 P029 P030 P098 P104 P106 P121 U019 U031 U044 U080 U134 U188 U210 U220	167	N	$50,100	$50,100	$0
D003 D008 D018 D027 D028 D029 D039 D040 F001 F002 F003 F005 P001 P020 P022 P030 P037 P039 P040 P048 P051 P070 P071 P075 P089 P	109	N	$32,700	$32,700	$0
F011	106	Y	$31,800	$23,320	($8,480)
D001 D002 P063 P069	95	N	$28,500	$28,500	$0
D005 D006 D007 D009 D011 F001 F002 F003 F004 F005 F006 F007 F009 F011	90	N	$27,000	$27,000	$0
D006 F001 F002 F003 F005 P006 P021 P029 P031 P033 P068 P076 P078 P098 P105 P106 P122 U088 U089 U115 U127 U129 U133 U134 U135	77	N	$23,100	$23,100	$0
K011 K013 P063 U002 U003 U009	41	N	$12,300	$12,300	$0
D018 D019 D020 D021 D022 D023 D024 D025 D026 D027 D028 D029 D030 D031 D032 D033 D034 D035 D036 D037 D038 P022 P030 U080 U122	35	N	$10,500	$10,500	$0
D001 D002 D003 D005 D007 D008 D009 D040 F001 F002 F003 F005 P030 U002 U012 U044 U122 U220 U221	35	N	$10,500	$10,500	$0
F012	23	Y	$6,900	$5,060	($1,840)
P030	17	Y	$5,100	$3,740	($1,360)
D001 D002 D003 D003 D007 D010 D011 F006 F007 F008 F011 P106	15	Y	$4,500	$3,300	($1,200)
D003 F007 F008 P029 P030	15	Y	$4,500	$3,300	($1,200)
F006 F007 F008 F009 F011 F012	12	Y	$3,600	$2,640	($960)
D002 D004 D004 D009 D010 F005 F007 F008 F009 F019 K046 K061 K062 K069 P106	11	N	$3,300	$3,300	$0
P001 P004 P005 P010 P018 P020 P030 P037 P039 P041 P048 P050 P058 P059 P063 P068 P070 P071 P089 P094 P105 P108 P123	11	N	$3,300	$3,300	$0
D001 D002 D003 D004 D005 F002 F004 F005 K022 K084 K136 P012 P059 P062 P099 P105 P106 P109 U018 U020 U064 U145 U146 U187 U237	10	N	$3,000	$3,000	$0
D003 D005 D007 F011 P106	10	Y	$3,000	$2,200	($800)
P063 P069	8	N	$2,400	$2,400	$0
D003 D006 D007 D008 F007 F008 F009 F011	6	Y	$1,800	$1,320	($480)
F008 P030	6	Y	$1,800	$1,320	($480)
F007 P030	4	Y	$1,200	$880	($320)
P029 P030 P09[illegible] P106	4	Y	$1,200	$880	($320)

* Wastest[illegible] are considered to be not affected (i.e., "N") if additional waste codes prese[illegible]nt the use of less costly treatment.

EXHIBIT 12
ANALYSIS OF CYANIDE WASTESTREAMS POTENTIALLY AFFECTED BY THE UTS

WASTESTREAM WASTE CODE(S)	QUANTITY REPORTED IN 1991 BRS (TONS)	AFFECTED BY UTS LEVEL*	BASELINE COSTS	POST-REG. COSTS	INCR. COSTS
D003 D004 D005 D006 D007 D008 D009 D010 D011 F007 F008 F009 F010 F011 F019	4	Y	$1,200	$880	($320)
D001 D002 D003 D004 D007 D011 K011 K013 P003 P016 P030 P063 P106 U001 U002 U003 U004 U009 U019 U053	4	N	$1,200	$1,200	$0
D001 F008 F011	4	Y	$1,200	$880	($320)
D003 D007 P106	3	Y	$900	$660	($240)
D003 F002 F008 P098 P106	3	N	$900	$900	$0
D003 F012	3	Y	$900	$660	($240)
P121	3	Y	$900	$660	($240)
D002 D005 D006 D008 P030 U188	2	N	$600	$600	$0
D003 D006 P026 P029	2	N	$600	$600	$0
D007 D008 F010 F011	2	Y	$600	$440	($160)
D001 D002 D003 D004 D005 D006 D007 D008 D009 D010 D011 F007 F008 F009 P021 P029 P076 P078	2	Y	$600	$440	($160)
D003 P106	2	Y	$600	$440	($160)
P063 U003	2	N	$600	$600	$0
P098	1	Y	$300	$220	($80)
D003 P030 P106	1	Y	$300	$220	($80)
D003 D004 D005 D006 D007 D008 D009 D010 D011 F006 F007 F008 F009 F010 F011 F019	1	Y	$300	$220	($80)
D003 P098	1	Y	$300	$220	($80)
D002 P068 P076 P078 P098 P105 P106 U115 U189 U246	1	N	$300	$300	$0
D002 D004 D007 D008 P098 P105	1	N	$300	$300	$0
D003 F008 P030 P106	1	Y	$300	$220	($80)
P098 P106	1	Y	$300	$220	($80)
D003 D011 P104 P106	1	Y	$300	$220	($80)
D003 D007 F011	1	Y	$300	$220	($80)
P021 P068 P098 P105 P106 P122 U048 U098 U115 U133 U134 U135 U147	1	N	$300	$300	$0
F009 P106 P121	1	Y	$300	$220	($80)
D003 P030	1	Y	$300	$220	($80)
D003 P106 P121	1	Y	$300	$220	($80)
P063	1	Y	$300	$220	($80)
D001 D004 D007 D012 D013 D014 D015 D016 D018 D019 D020 D022 D024 D027 D028 D029 D035 D038 D040 F002 F003 F004 F005 P020 P050	1	N	$300	$300	$0
D003 F011	1	Y	$300	$220	($80)
D005 F011	1	Y	$300	$220	($80)
D003 P029 P106 P121	1	Y	$300	$220	($80)
D003 D009 P021 P029 P030 P074 P098 P104 P106 P121	1	Y	$300	$220	($80)
P029	1	Y	$300	$220	($80)
D008 P106	1	Y	$300	$220	($80)
P010 P012 P016 P024 P037 P046 P075 P077 P081 P098 P105 P106 P108 P116 P119 P120 P121	1	N	$300	$300	$0
D005 D007 D008 D010 D011 F007 F008 F011 F012 LABP LABP	1	Y	$300	$220	($80)
			$66,615,000	$66,518,280	($96,720)

* Wastestreams are considered to be not affected (i.e., "N") if additional waste codes present prevent the use of less costly treatment.

of $100,000. The cost savings associated with the redefinition of recycling of K069 wastes is presented in Exhibit 3-13. As this exhibit shows, the potential avoided treatment cost is $600,000.

EXHIBIT 3-13

COSTS ASSOCIATED WITH K069 WASTES

Quantity (tons)	Baseline Treatment	Unit Cost	Total Avoided Cost
1,360	Stabilization	$220	$300,000
1,270	Landfilling	$251	$320,000

3.2.3 Sensitivity Analyses for Organic TC Wastes

Permit Modification Costs. EPA conducted a sensitivity analysis to determine whether permitting costs for the nine facilities for which it had originally assumed on-site treatment based on permit information in the RCRIS database would incur significant permit modification costs. EPA reviewed an earlier analysis to estimate permit modification costs on a per facility basis. The earlier analysis, conducted, in part, to support RCRA reauthorization and the corrective action studies, assumed that for on-site treatment, the permit application and process would cost $60,000 over the first two years, there would be no further modifications, and a renewal cost of $23,000 would be realized every five years.

EPA applied this schedule of payments to the RIA analysis by assuming the following. Since eight facilities have only submitted the first part of the permit application, they will need to "modify" their application immediately (i.e., adjust the Part B application before submittal). EPA did not consider new operating costs associated with modified permits, such as worker training. EPA assumed, conservatively, that permit modification would cost the same as a full application, namely $60,000 in the first year. EPA further assumed that renewals would take place every five years for twenty years, roughly, the effective life of the treatment process. Thus, EPA assumed the facility-specific schedule of payments would be as follows:

Year:	0	5	10	15	20
Payment:	$60,000	$23,000	$23,000	$23,000	$23,000

While this schedule of payments is conservative, for example, realizing the full $60,000 in year one rather than over two years, EPA believes it approximates the order of magnitude of permitting costs likely to be associated with this rule.

Exhibit 3-14 shows the per facility present value and annualized cost and the total annual incremental cost for six scenarios. EPA calculated the costs for both eight and nine affected facilities for three discount rates: 4 percent, 6 percent, and 10 percent. The period of over which the cost is annualized is 20 years in all scenarios.

EXHIBIT 3-14

PERMIT MODIFICATION COSTS ASSOCIATED WITH PHASE II LDRs

DISCOUNT RATE	PRESENT VALUE COST PER FACILITY	ANNUALIZED COST PER FACILITY ($/yr)	NO. OF FACS.	TOTAL ANNUAL INCREMENTAL COST ($/yr)
4 percent	$120,000	$8,800	8	$70,000
4 percent	$120,000	$8,800	9	$79,000
6 percent	$110,000	$9,600	8	$77,000
6 percent	$110,000	$9,600	9	$86,000
10 percent	$92,000	$11,000	8	$88,000
10 percent	$92,000	$11,000	9	$99,000

The total annual incremental cost due to permit modifications ranges from $70,000 to $99,000. This would have no significant effect on the overall cost of the rule as developed in the RIA, since the total annual incremental cost of the rule is $219 million. The permit modification

costs associated with these nine facilities would increase the total cost of the rule by 0.05 percent at the most, an effect well within the rounding error for the RIA cost calculation.

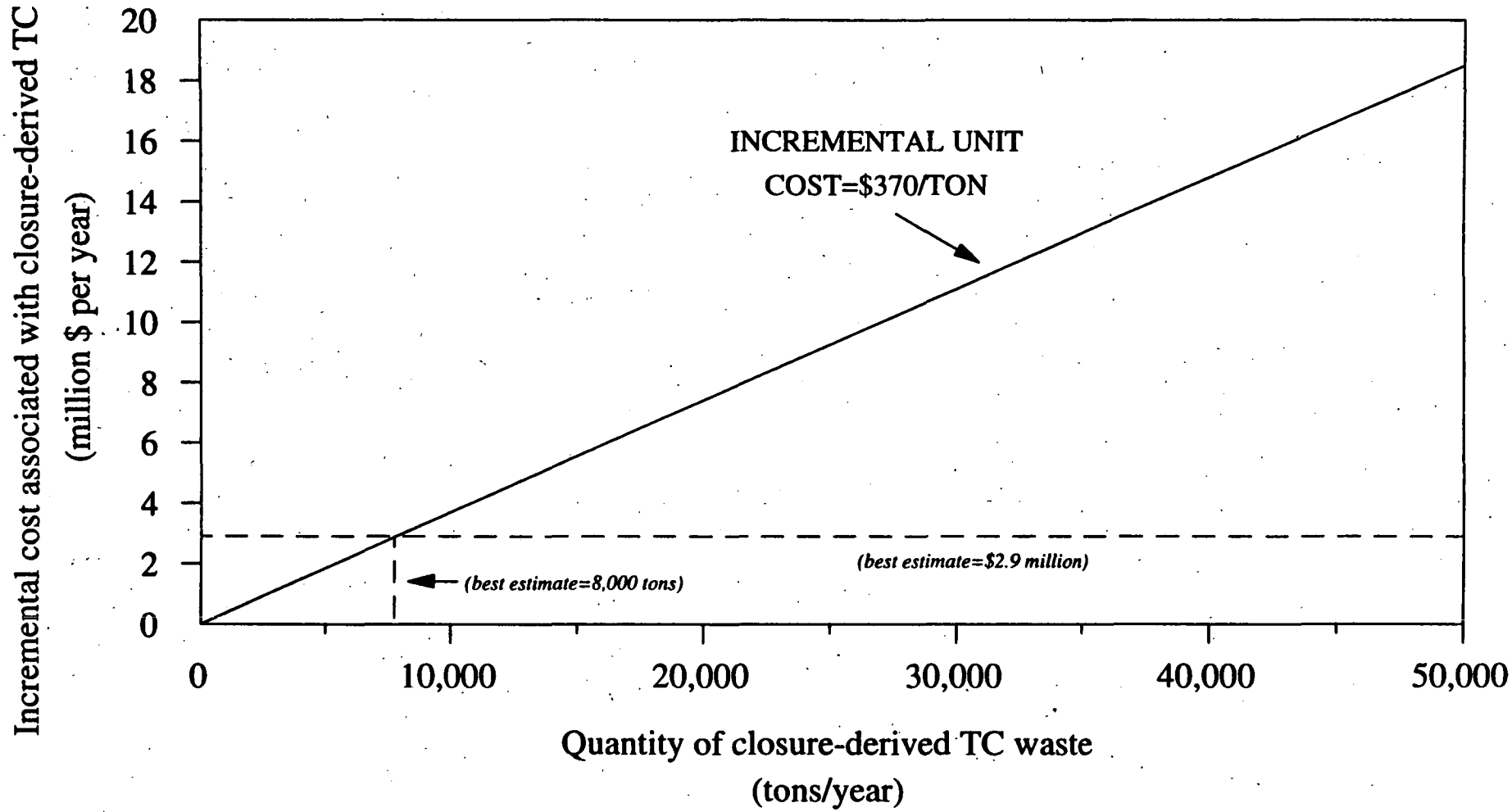
TC Waste From Closures. EPA conducted a sensitivity analysis to determine the effect on results of including the costs incurred as a result of TC waste generated during closure. EPA approached this order-of-magnitude estimate by reviewing the analysis of contaminated soil conducted as part of EPA's HWIP analysis. According to EPA's earlier studies, as presented in the HWIP analysis, of the total 2.1 million tons/year of affected soil, 160,000 tons/year are a result of RCRA closures. The ratio of RCRA closure-derived soil to all other remediation soil, then, is 0.16 to 1.94 (i.e., 2.1 *minus* 0.16). Using this ratio, EPA estimated the quantity of TC closure-derived soil by multiplying the total quantity of TC hazardous soil, 94,000 tons/year, by 8.25 percent (i.e., 0.16/1.94), calculating 8,000 tons/year of closure-derived TC soil.

Since EPA's estimated incremental annual cost for TC hazardous soil is $35 million, based on 94,000 tons per year (i.e., $370 per ton), then an additional 8,000 tons of closure-derived TC soil would have an associated incremental annual cost of $2.9 million. This would increase the total cost of the rule by roughly one percent. Exhibit 3-15 plots incremental cost as a function of the quantity of closure-derived TC waste.

This order-of-magnitude estimate encompasses four limiting assumptions. First, EPA assumes that only soil will be generated in significant amounts during closure. Second, EPA assumes that the proportion of closure-derived TC soil to other remediation TC soil is the same as the ratio for all hazardous soil (i.e., including non-TC soil). Third, EPA assumes the technologies used for closure-derived TC soil will be the same as for TC remediation soil. A final limitation is that it is impossible to determine how much overlap there is between the estimate of hazardous soil reported in the HWIP analysis and the 94,000 tons/year of newly regulated TC hazardous soils. This indeterminable overlap affects the accuracy of EPA's estimate.

Testing Costs. For its cost estimate, EPA assumes that there is one waste sample and one QA/QC sample for each test performed. EPA also performed a sensitivity analysis of the testing cost for affected TC wastes in which it varied (1) the frequency with which waste is tested for identification, and (2) the number of wasteloads which are treated, and thus require testing, each

Exhibit 3-15
SENSITIVITY ANALYSIS: COST OF TREATING CLOSURE-DERIVED TC WASTE



year. TC wastes must be tested to determine the underlying hazardous constituents. In the RIA, EPA assumed that waste-generating processes have a four-year effective life; i.e., after four years a given process undergoes significant modification such that its wastestream must be re-characterized. For this sensitivity analysis, EPA varied the effective life of waste-generating processes for TC nonwastewaters from 3 months to 10 years. EPA assumed each TC soil wasteload must be tested for identification purposes since TC soil is not generated by a specific process. EPA also varied the number of wasteloads tested per year. For TC nonwastewaters, the number of wasteloads tested each year varies from 1 to 12. Since EPA implicitly assumed that soil is generated at one-fourth the frequency of TC nonwastewaters, the frequency of testing for TC soil wasteloads ranges from once every four years to three times each year.

Exhibit 3-16 presents the results of the sensitivity analysis. Given the parameters specified above, the total testing cost could range from $800,000 per year to $11.2 million per year, or a negative one percent to a positive four percent incremental change in the total cost of the rule.

3.2.4 Waste Minimization of Organic TC Wastes

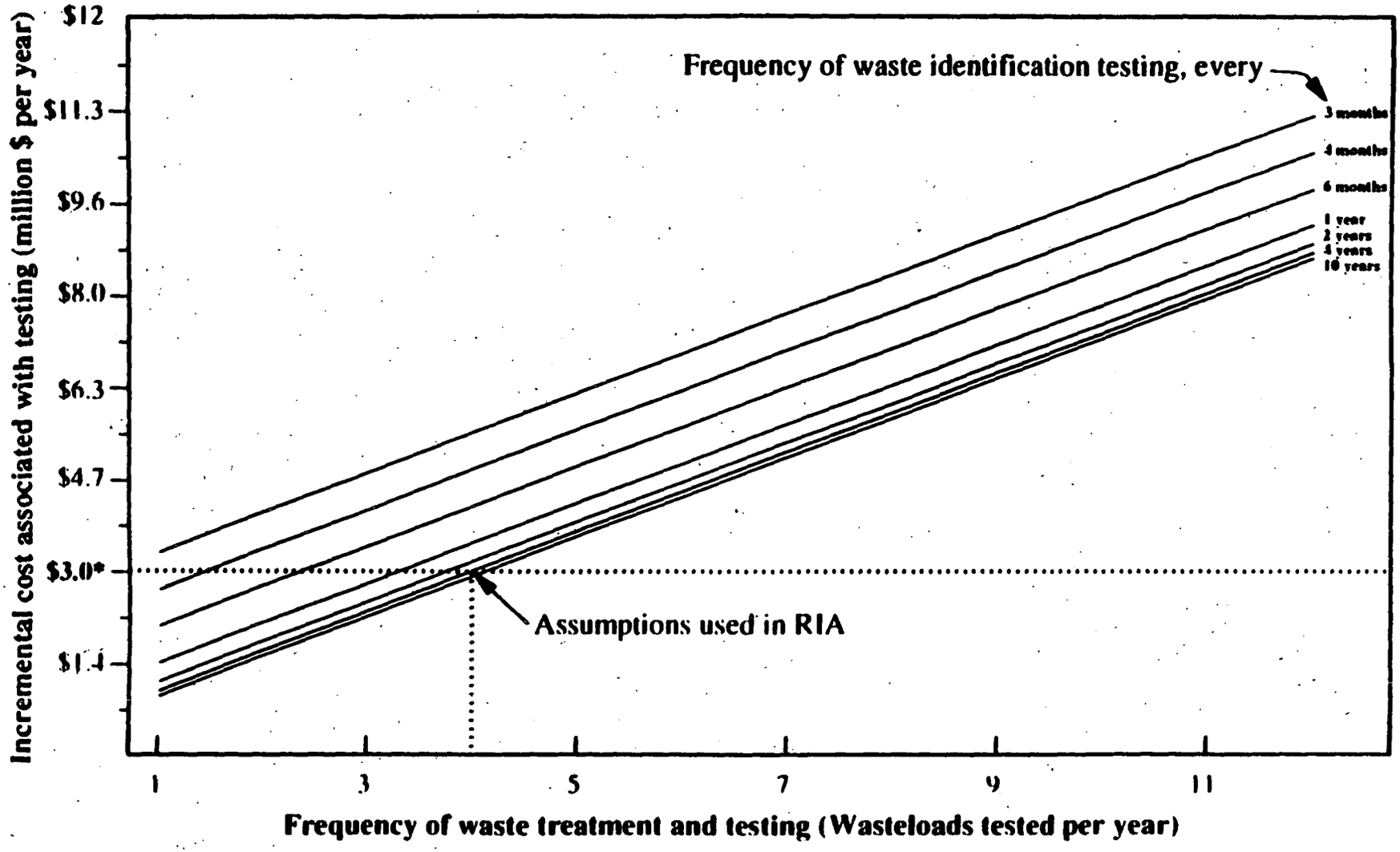
The total cost savings estimate for the waste minimization analysis of the Phase II Rule was approximately $25 million annually. This is made up of $22 million from tank bottoms savings, and $3 million from lime sludges savings. A description of these savings is provided below.

Recycle of Tank Bottoms. Oil product storage tank bottoms (referred to as tank bottoms hereafter) represents one of the largest wastestreams in the database readily amenable to waste minimization. A number of alternative waste minimization alternatives were considered:

- Storage tank mixing to reduce deposition,
- Sludge coking, and
- Phase separation by centrifuge and recycle of recovered feedstock.

EXHIBIT 3-16

SENSTIVITY ANALYSIS: PHASE II LDR TESTING COST FOR AFFECTED TC WASTES



Phase separation by centrifuge was selected as the most viable alternative due to its applicability across all types of oil product tank bottoms and its general applicability in facilities of various design. Storage tank mixing and sludge or centrifuge solids coking are still viable alternatives that may be implemented separately to, or in conjunction with, centrifuging on a facility-specific basis to further reduce tank bottoms or solids disposal. They are, however, not considered within this case study.

A decanter type centrifuge was selected due to its ability to accept virtually any type of pumpable liquid/solid mixture and its ability to operate in a continuous mode. The decanter type centrifuge is capable of a 98.5 percent oil/water/solids separation while producing a sludge cake in excess of 40 percent solids. For this case study a more conservative 90 percent oil/water separation and a 95 percent solids removal with a 30 percent solids cake is assumed. The conceptual design is a three-phase (water, oil, and solids) decanter centrifuge with a 30 gallon per minute (gpm) capacity, mounted on a trailer with a 1,000 gallon feed surge tank, a 1,000 gallon oil product tank, a five cubic yard dumpster for solids storage, and appropriate pumps and level controllers. The initial capital investment costs were calculated to be about $200,000 with a salvage value of about $39,000 after a 15 year life.

The oil product stream from the centrifuge is returned to the process stream as a resource with a value of $16.00 per barrel. The water phase is discharged to the industrial sewer, and the solids are disposed by either landfilling, if non-hazardous, at a cost of $75 per ton, or off-site incineration, if hazardous, at a cost of $1,280 per ton. As the total quantity of wastewater treated at the database facilities is not known, it is not possible to assign an incremental treatment cost to the water phase. It is suspected that the incremental cost would be insignificant.

The potential annualized costs of the waste minimization alternative were calculated for tank bottom quantities representative of the range of facility tank bottom generations in the database -200 tons, 500 tons, 1,000 tons, and 5,000 tons per year. The annualized costs of the post-regulatory compliance alternative, incineration and subtitle D disposal, are calculated over the same project life as the waste minimization alternative (15 years) at the same escalation rate and discount rate. Both annualized costs were adjusted for corporate tax liability. The net potential waste minimization annualized savings were calculated by subtracting the waste

minimization alternative costs from the post rule compliance alternative costs for the four tank bottom quantities indicated above.

Exhibit 3-17 provides the annualized pre-tax costs and savings associated with the waste minimization alternative and the post-regulatory compliance alternative for various quantities of tank bottoms representative of the generators found in the database. Column A (and E) represents the quantity of tank bottoms, i.e., 200 tons per year. Column B is the annualized pre-tax cost of the waste minimization alternative (centrifuging) for the various quantities of tank bottoms shown in Column A, i.e., $50,831 for annual tank bottom quantities of 200 tons per year. Column C is the annualized pre-tax cost for incinerating (post-regulatory compliance alternative) the post-Phase II Rule hazardous tank bottoms assuming no waste minimization is performed, i.e., $337,243 for annual tank bottom quantities of 200 tons per year. Column D is the net annualized pre-tax savings realized in implementing the waste minimization alternative and is calculated by subtracting the waste minimization cost (Column B) from the incineration cost (Column C), i.e., $337,243 minus $50,831 equals $286,412 of net annualized pre-tax savings for minimizing 200 tons of tank bottoms per year. Column F is the annualized factor (AF) calculated using the formula shown in Exhibit 3-4. The net present value, NPV, (Column G) is calculated by dividing the net annualized pre-tax savings (Column D) by the annualized factor, AF, (Column F). Column H is the net annualized pre-tax savings on a per ton of tank bottom basis obtained by dividing the net annualized pre-tax savings (Column D) by the tonnage of tank bottoms (Column E). Likewise, Column I is the net present value on a per ton of tank bottom basis obtained by dividing the net present value (Column G) by the tonnage of tank bottoms (Column E).

The net annualized pre-tax waste minimization savings ranged from $286,412 for 200 tons of tank bottom per year to $7,804,774 for 5,000 tons of tank bottoms. A graph of the potential net annualized pre-tax savings per tank bottom quantities is shown in Exhibit 3-18. The data points are approximately linear and represent a potential pre-tax annualized savings of about $1,560 per ton of tank bottoms. The pre-tax net present value (NPV) ranged from $2,528,192 for 200 tons of tank bottoms to $68,893,674 to 5,000 tons of tank bottoms.

The net annualized post-tax waste minimization savings ranged from $187,370 for minimizing 200 tons of tank bottoms per year to $5,150,000 for minimizing 5,000 tons of tank bottoms per year. The post-tax net present value (NPV) was also calculated for the same tank

EXHIBIT 3-17

CALCULATION OF POTENTIAL COSTS/COST SAVINGS FOR TANK BOTTOMS

Worksheet 5

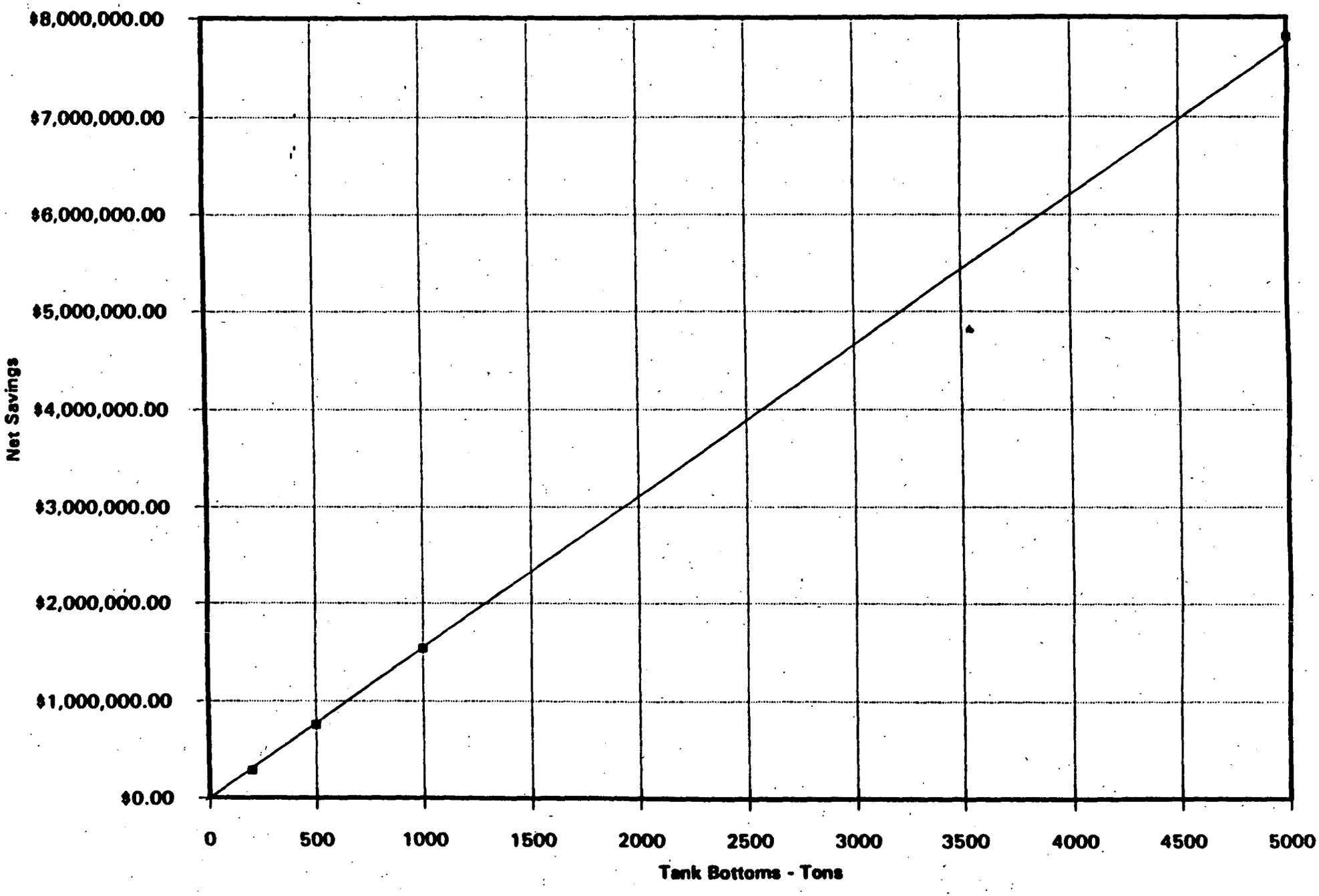
Financial Calculations
Tank Bottoms
Annualized Pre-Tax Costs and Savings

d = 0.075
n = 15

d = Discount rate
n = Project lifetime

A	B	C	D	E	F	G		H	I
Tank Bottoms	Waste Minimiztion	Incineration	Savings	Tons	AF	NPV		Savings	NPV
	Pre-Tax Cost	Pre-Tax Cost	Net	Btms				per ton	per ton
Hazardous Centrifuge Residual Solids									
200 tons	$50,831.14	$337,243.06	$286,411.92	200	0.1133	$2,528,192.35		$1,432.06	$12,640.96
500 tons	$86,798.11	$843,107.66	$756,309.55	500	0.1133	$6,676,034.95		$1,512.62	$13,352.07
1000 tons	$146,743.07	$1,686,215.32	$1,539,472.26	1000	0.1133	$13,589,105.95		$1,539.47	$13,589.11
5000 tons	$626,302.71	$8,431,076.62	$7,804,773.91	5000	0.1133	$68,893,673.90		$1,560.95	$13,778.73

EXHIBIT 3-18
PRE-TAX SAVINGS FROM TANK BOTTOMS



bottom quantities and respectively ranged from $1,654,000 at 200 tons to $45,455,000 at 5,000 tons.

Reuse of Lime Sludge. One petroleum refinery indicated they produced a 6,400 TPY dewatered lime sludge from groundwater treatment that was contaminated with benzene and petroleum liquids. The facility stated that a cement kiln was willing to accept the sludge as feedstock at a cost to the refinery. The cost per ton was not given. Therefore, a cost of $50 per ton was assumed based on the cost for lime ($50/ton from Chemical Prices March 18, 1994). Assuming no annual change in the charge for the lime sludge, reuse of the lime sludge would cost $465 per ton less than end-of-pipe treatment. The annualized potential cost savings is $3,000,000.

Regeneration of Contaminated Catalysts. The TCDMS showed two refineries were instituting regeneration of contaminated spent catalysts rather than waste disposal. One refinery stated they realized a savings of $37 per ton of catalysts by regenerating rather than disposing of the catalyst. Four refineries reported previous waste disposal of spent catalyst. However, the total volume for all four facilities was less than 65 tons per year. Potential savings were determined to be insignificant. Note that one facility with 270 tons per year of spent catalyst waste was instituting waste minimization; however, the catalyst wastestream was not listed in TCDMS.

Other Factors Affecting the Results. The work assignment methodology was directed at estimating the cost savings to industry from waste minimization associated with compliance to the Phase II LDR rule. The analysis only covered newly identified TC wastes that were being regulated under this rule. However, a significant percentage of these TC wastes are not amenable to source reduction or recycling waste minimization activities because they are:

- Wastes generated from closures and corrective actions.
- Wastes generated from remediation activities.
- Contaminated soils and debris.

Among the reasons these wastes are not amenable to waste minimization activities include:

- These wastes are generally not routinely generated.

- Particularly in the case of contaminated media and closure and remediation wastes, the wastes are generated as a result of releases to the environment, and as such, once the release has occurred and the wastes have been generated, there is little or no opportunity for minimization.

- Particularly in the case of contaminated media, it is often the case that the concentration of the contaminant(s) of concern is too low to be economically recovered.

It is important to note for this analysis that even though many of the newly identified TC wastes are not amenable to waste minimization activities, other wastes subject to the Phase II LDRs, such as residuals from manufacture of chlorotoluenes and coke, are amenable to waste minimization activities.

These estimates likely understate savings potential for two reasons. First, discussions with regulated facilities suggest that there are newly regulated TC wastes being minimized that are not included as part of the cost baseline developed for the Phase II RIA. Savings associated with these wastestreams have not been integrated into our savings estimate because of a desire to maintain consistency with the cost analysis. Second, we have given only cursory consideration to wastes received by commercial TSDs. The analysis presented in Appendix A indicates three of the largest wastestreams received by TSDs have the potential for waste minimization. In most cases, there is insufficient information to determine the waste minimization potential for these wastes at the generator level. Since these wastes represent roughly half of the universe of newly regulated waste, they may present additional waste minimization savings potential.

3.3 LIMITATIONS OF THE ANALYSIS

Both the data used for this analysis and the methodologies developed have limitations. The most important limitations are addressed below.

- The use of on-site/off-site treatment designations provided by the Capacity Programs Branch in their database (over 99 percent of the TC waste is designated for off-site treatment) may not reflect long-term management. To the extent that EPA overestimated the quantity shipped off-site for treatment, EPA overestimated the cost of the rule.

- Our unit costs are based on off-site treatment and our earlier work for on-site treatment (see section 3.1.1). Since there are wide ranges of unit costs for each technology, EPA has used the mid-point of the range. To determine the effect of the wide range of unit costs, EPA has run its model using the low end of the range and the high end. EPA found that the annual incremental cost of $219 million TC wastes should be viewed as a best estimate with a range of error from 60 percent below this value ($87 million) to 65 percent above this value ($360 million).

- The main source of unit costs are vendor quotes and are "prices" charged for treatment services. These prices measure the "cost" to waste generators who ship waste off-site or who hire on-site vendor services. Since these prices are determined by market factors, they are typically higher than the actual cost of treatment. Moreover, since these prices can include transfer payments—such items as insurance, interest, and profit in excess of full competition—they may overestimate the true social costs.

- For TC nonwastewater waste, EPA have removed all quantities that have both a "D" waste code and a RCRA listed waste code. While over 400,000 tons of waste were reported as listed and characteristic, the data rarely reported the constituents

present in the wastestream. Consequently, EPA assumed that treatment by the listed waste standard would also treat all underlying constituents to required levels. EPA acknowledges that this lack of data may create a significant false negative; to that extent, the analysis may underestimate the true cost of the rule.

- When assigning treatment technologies for cost estimation purposes, EPA assigned nonwastewater, soil, and debris streams to thermal desorption technologies. While the Agency believes that thermal desorption may have future application to the treatment of RCRA wastes, it acknowledges that currently there are no permitted thermal desorption units in operation. Therefore, EPA conducted a sensitivity analysis to estimate the effect on treatment costs if thermal desorption were not available.

  To conduct the sensitivity analysis, EPA first determined the total tonnage of each waste form that had been assigned to thermal desorption or to a combination of thermal desorption and other technologies (e.g., thermal desorption followed by stabilization) (see Appendix C for current percentages). For soils, the thermal desorption category had been combined with soil vapor extraction technologies because of similar unit costs and applicability. Because these wastes were never specifically assigned to one of the two specific technologies, EPA assumed that half would be treated by thermal desorption. EPA then selected alternative technologies to be used if thermal desorption were not available. For nonwastewater and soil, EPA selected incineration, and for debris, EPA selected extraction. In cases where a treatment train had been assigned, EPA assumed that only the thermal desorption portion would change and the remaining elements (e.g., stabilization) would be unchanged.

  Using unit costs from the main analysis for thermal desorption and the alternative technologies (see Appendix D), EPA estimated the cost increase for each waste form. For nonwastewaters, the cost for treating the affected wastestreams

increased from $21 million to $53 million; for soil, the cost increased from $13 million to $30 million; and for debris, the cost increased from $2 million to $4 million. In summary, the total treatment costs increased from $37 million to $87 million, or an increase of $50 million.

This cost increase reflects the potential underestimate of costs if thermal desorption was not employed for treating these wastes. In addition, this sensitivity analysis shows what the costs of the rule may be immediately following promulgation of the rule (i.e., before thermal desorption capacity, or other less costly treatment, comes on line).

CHAPTER 4
ECONOMIC IMPACTS OF PHASE II LAND DISPOSAL RESTRICTIONS

The economic impacts of the rule are measured as the difference between the likely expenses that result from regulatory compliance and the industrial activity that would continue in the absence of regulation (i.e., baseline conditions). EPA typically considers economic impacts based on the private cost of regulation evaluated on a facility-specific basis.

4.1 ECONOMIC IMPACTS METHODOLOGY

Economic impacts for facilities managing organic TC wastes were evaluated on a facility-specific basis, limited only by the extent that data were available. This economic analysis is based on 20 of the 47 facilities for which costs were determined on a facility-specific level. EPA estimated the economic effects by comparing incremental annual compliance costs to two financial measures: revenue, and cost of operations (i.e., cost and expenses). The most recent financial data available were obtained from Standard & Poor's Corporation Records, Dunn and Bradstreet's Million Dollar Directory, and Disclosure Information Services.

Since EPA believes that no costs will be associated with the treatment standards for coke by-products in the proposed rule, no economic impacts will be associated with the regulation of these wastes. Economic impacts of compliance for facilities currently land disposing chlorotoluene waste were evaluated on a facility-specific basis. EPA estimated the economic effects by calculating the ratio of the incremental annual before-tax compliance costs to the value of production. Baseline and compliance before-tax annualized costs were estimated for each facility using the unit costs, prices, and waste quantities presented in the cost analysis. Data on total sales for facilities that generate chlorinated toluene wastes were obtained from Dun & Bradstreet.

4.2 RESULTS OF THE ECONOMIC IMPACTS ANALYSIS

For the 14 captive companies (i.e., companies with non-commercial or captive landfills that receive the company's wastes) in the TC capacity database, only one company would have a ratio of incremental compliance cost to cost of operations greater than one tenth of one percent; all other facilities would experience even lower economic impacts. See Tables 4-1 and 4-2 for

results. Note that Table 4-2 presents the logarithm of the ratio; in this way it provides an estimate of the order of magnitude of the effect. For example, the ratio of revenues to compliance cost for the first facility has a log of 5.07. That is, revenues are 5 orders of magnitude, ~100,000 times, greater than the cost of compliance. Similarly, the ratio of compliance cost to cost and expenses has a log of -4.99. That is, the compliance cost is 5 orders of magnitude less, or 0.00001 times the non-regulatory cost and expenses.

Since no costs are associated with the treatment standards for coke by-products, no economic impacts are expected. Economic impacts for facilities that generate chlorinated toluene wastes are calculated based on the before-tax annualized incremental costs. The results of the analysis, however, are aggregated since the data used in the analysis are propriety. Based on a ratio analysis of incremental cost to total sales, none of the facilities that generate these wastes is expected to experience significant impacts as a result of the proposed rule.

4.3 LIMITATIONS OF THE ANALYSIS

Both the data used for this analysis and the methodologies developed have limitations. The most important limitations are addressed below.

- Not all the facilities in the TC capacity database, the primary data source for this analysis, make financial information publicly available.

- Five captive companies with public financial information have more than one facility; there is no way to determine economic effects at the facility level. Thus, our analysis is limited to company-wide economic effects. To the extent that companies cannot redistribute the cost of compliance among facilities, our analysis may not identify facilities with economic effects at the local level.

TABLE 4-

PHASE II LDR ECONOMIC IMPACTS

NON-COMMERCIAL FACILITIES AFFECTED: FINANCIAL DATA AND ESTIMATED COST OF COMPLIANCE

(all figures in $million/yr)

FACILITY	SIC CODE	PARENT COMPANY	FISCAL YEAR	REVENUE	COSTS & EXPENSES	OPERATING INCOME	NET INCOME	COST OF COMPLIANCE
30	2812-ALKALINES & CHLORINES	DOW CHEMICAL CO.	1992	18,971	15,661*	3,310(est)	(489)	0.16
23	2821-PLASTICS MATERIALS AND RESIN	OCCIDENTAL PETROLEUM CORP.	1992	8,494	8,058	436	(591)	1.81
34	2869-INDUS. ORG. CHEMICALS NEC	AMOCO CORP.	1992	25,280	26,307	(1,027)	(74)	0.05
27	2869-INDUS. ORG. CHEMICALS NEC	EASTMAN KODAK CO.	1993	16,364	15,567*	797(est)	(1,515)	0.00
9	2869-INDUS. ORG. CHEMICALS NEC	UNION CARBIDE CORP.	1992	4,872	4,426	446	(175)	0.35
33	2869-INDUS. ORG. CHEMICALS NEC	UNION CARBIDE CORP.	1992	--	--	--	--	1.13
28	2911-PETROLEUM REFINING	AMOCO CORP.	1992	--	--	--	--	12.55
38	2911-PETROLEUM REFINING	ATLANTIC RICHFIELD CO.	1993	18,487	16,508	1,979	269	4.63
29	2911-PETROLEUM REFINING	CHEVRON CORP.	1992	41,428	38,487	2,941	1,569	0.94
25	2911-PETROLEUM REFINING	EXXON CORP.	1993	115,000	101,580	13,420	5,280	0.89
16	2911-PETROLEUM REFINING	EXXON CORP.	1993	--	--	--	--	0.84
12	2911-PETROLEUM REFINING	E.I. DUPONT DE NEMOURS & CO.	1992	38,695	33,616	5,079	1,403	0.56
15	2911-PETROLEUM REFINING	E.I. DUPONT DE NEMOURS & CO.	1992	--	--	--	--	0.07
35	2911-PETROLEUM REFINING	MAXUS ENERGY CORP.	1992	718	523	196	74	1.55
32	2911-PETROLEUM REFINING	SHELL OIL CO.	1993	24,700	20,034*	4,666(est)	5,998	1.19
39	2911-PETROLEUM REFINING	SHELL OIL CO.	1993	--	--	--	--	0.75
5	2911-PETROLEUM REFINING	SHELL OIL CO.	1993	--	--	--	--	5.47
13	2911-PETROLEUM REFINING	TOTAL PETROLEUM (NORTH AMERICA), LTD.	1992	2,397	2,382	15	2	0.95
3	2911-PETROLEUM REFINING	USX CORP.	1992	17,841	17,523	318	1,826	0.02
7	9511-WASTE MANAGEMENT	ASHLAND OIL, INC.	1993	10,199	9,959	240	142	1.94
							TOTAL	35.85

* Information only available for 1991

Figures in parentheses represent deficits

TABLE 4-2
PHASE II LDR ECONOMIC IMPACTS
NON-COMMERCIAL FACILITIES AFFECTED: ESTIMATE OF MAGNITUDE OF ECONOMIC EFFECT
(all figures in common logarithms)

FACILITY ID	SIC CODE	PARENT COMPANY	REV./ COMP.COST	COMP.COST/ COSTS&EXP.
30	2812-ALKALINES & CHLORINES	DOW CHEMICAL CO.	5.07	-4.99
23	2821-PLASTICS MATERIALS AND RESIN	OCCIDENTAL PETROLEUM CORP.	3.67	-3.65
27	2869-INDUS. ORG. CHEMICALS NEC	EASTMAN KODAK CO.	6.61	-6.59
9	2869-INDUS. ORG. CHEMICALS NEC	UNION CARBIDE CORP.		
33	2869-INDUS. ORG. CHEMICALS NEC	UNION CARBIDE CORP.		
		UNION CARBIDE CORP. SUBTOTAL	3.57	-3.53
34	2869-INDUS. ORG. CHEMICALS NEC	AMOCO CORP.		
28	2911-PETROLEUM REFINING	AMOCO CORP.		
		AMOCO CORP. SUBTOTAL	3.30	-3.32
38	2911-PETROLEUM REFINING	ATLANTIC RICHFIELD CO.	3.61	-3.56
30	2911-PETROLEUM REFINING	CHEVRON CORP.	4.74	-4.70
25	2911-PETROLEUM REFINING	EXXON CORP.		
16	2911-PETROLEUM REFINING	EXXON CORP.		
		EXXON CORP. SUBTOTAL	4.86	-4.81
12	2911-PETROLEUM REFINING	E.I. DUPONT DE NEMOURS & CO.		
15	2911-PETROLEUM REFINING	E.I. DUPONT DE NEMOURS & CO.		
		E.I. DUPONT DE NEMOURS & CO. SUBTOTAL	4.79	-4.73
35	2911-PETROLEUM REFINING	MAXUS ENERGY CORP.	2.76	-2.62
32	2911-PETROLEUM REFINING	SHELL OIL CO.		
39	2911-PETROLEUM REFINING	SHELL OIL CO.		
5	2911-PETROLEUM REFINING	SHELL OIL CO.		
		SHELL OIL CO. SUBTOTAL	3.55	-3.45
13	2911-PETROLEUM REFINING	TOTAL PETROLEUM (NORTH AMERICA), LTD.	3.50	-3.50
3	2911-PETROLEUM REFINING	USX CORP.	5.95	-5.94
7	9511-WASTE MANAGEMENT	ASHLAND OIL, INC.	3.72	-3.71

- Financial data are based on the last year reported and may not accurately predict longer-term company results.

- EPA estimated the economic impacts of the proposed rule for non-commercial facilities. In attempting to determine costs associated with commercial facilities, EPA matched BRS data for generators sending waste off-site to commercial facilities identified in the TC Survey. The results were inconclusive because data from these two sources were inconsistent and left a large percentage of waste unaccounted for. Therefore, due to data limitations, for the commercial facilities that receive waste from off-site generators, EPA did not look at cost pass-through scenarios to estimate if any generators would be affected by the proposed rule.

- No small businesses or entities were identified in the TC capacity database, however, they may be impacted by commercial facility pass-throughs. EPA did not examine this effect.

CHAPTER 5
BENEFITS OF PHASE II LAND DISPOSAL RESTRICTIONS

This chapter discusses EPA's analysis of the benefits to society associated with the Phase II LDR final rule. While the RIA for the Phase II rule quantifies a number of benefits, there are potential benefits attributable to the rule that are unable to be quantified at this time. These potential benefits are grounded in the basic premise of the LDR program, that the only permanent solution to management of hazardous wastes is significant reduction of toxicity in such waste through treatment. Such treatment offers benefits to human health and the environment over the long-term.

EPA quantified three types of benefits for the Phase II rule:

- reduction in human health risks via the ground-water pathway,
- reduction in human health risks via the air pathway, and
- potential positive effects on the value of properties near waste management facilities.

In addition, EPA's benefit analysis covers only TC wastes. These wastes dominate the other newly regulated wastestreams covered by the Phase II LDRs in terms of volume and costs. Moreover, the data needed to evaluate the Phase II rule benefits were more readily available and of much higher quality for the TC wastes' attributes (e.g., concentration, volume) than for the other Phase II wastes.

5.1 HUMAN HEALTH RISK REDUCTION — GROUND-WATER PATHWAY

One of HSWA's primary LDR goals is protecting human health. To that end EPA analyzed human health risks posed by TC wastes under the baseline scenario, that is with no LDRs in place, as well as under the post-regulatory scenario. The difference in risks from the baseline to the post-regulatory scenario is one measure of the benefit of the rule. The benefits estimated in this analysis focus on the long-term benefits associated with the permanence of waste treatment. However, this assessment is limited to benefits realized under average or reasonably expected conditions. It is not able to estimate the benefits associated with more extreme scenarios, such as a catastrophic landfill containment system failure or karst aquifer settings. Under these extreme cases, the benefits of the Phase II LDR would be greater.

The fundamental concept underlying EPA's approach for assessing ground-water risk reduction is that Subtitle C containment is completely effective in the short-term, i.e., over a period of about 30 years after liner and cover installation. During this period, no leachate is released to ground water, and Subtitle C regulation achieves its goal of reducing risk to human health and the environment. Over the longer term, however, containment systems eventually and, because the waste in the unit has not been treated, constituents are released to the environment. This release, and its resulting ground-water contamination, may not be detected by owner/operators, and could continue unaddressed by corrective action, closure, or other programs. This longer-term risk (i.e., occuring in the future) would be reduced by the LDRs.

5.1.1 Approach

EPA used similar but slightly different approaches to calculate risks to hypothetical individuals and population risks across all facilities. The approaches are described below.

<u>Individual Risks</u>

EPA's basic approach involves the following seven steps:

(1) Analyze waste concentration data from the TC survey database to estimate waste concentrations.

(2) In cases where respondents reported total waste concentrations, rather than Toxicity Characteristic Leaching Procedure (TCLP) concentrations, use the Organic Leaching Model (OLM) to estimate leachate concentrations.

(3) Calculate the mean concentration of each constituent at each facility, weighted across the volume of all TC wastes managed at that facility.

(4) Calculate the risk that would be posed by consumption of leachate, for both cancer and non-cancer effects, at each facility.

(5) Develop a set of dilution/attenuation factors (DAF) to represent the effect of fate and transport processes in a ground-water system.

(6) Portray the full range of waste concentrations, environmental settings, and exposure conditions at facilities managing TC wastes by dividing the distribution of risks posed by consumption of leachate by the DAF distribution to yield a predicted risk distribution at exposure wells across all facilities.

(7) To simulate the post-regulatory scenario, reset the leachate concentration in Step 1 with the universal standard concentrations. Replace the DAF distribution for Subtitle C facilities (from Step 5) with a DAF distribution for Subtitle D facilities, because the treated TC residues will not need to be managed as hazardous wastes. Recalculate risks to estimate the incremental risk reduction between the baseline and post-regulatory levels.

The following discussion is keyed to the steps listed above.

Step 1. Develop concentration data from the TC survey to represent waste concentrations. The TC capacity database covers several hundred wastestreams, each containing one or more constituents, disposed of at nearly 100 facilities. To develop the analytical sample,

EPA dropped wastestreams with insufficient data or not subject to regulation as TC nonwastewaters. The following wastestreams were deleted:

- wastestreams that only include wastewater,
- wastestreams with no TC volume information,
- wastestreams that include listed wastes (F-, K-, P-, or U-codes),
- wastestreams with no useful constituent information,
- wastestreams that are nonwastewater and not regulated by Phase II,
- wastestreams that do not exceed TC levels for D018-D043.

After these wastestreams were dropped, the final sample of facilities that disposed of TC nonwastewaters contained 36 facilities. Benefits from this set of facilities were extrapolated to the universe of facilities managing nonwastewaters, i.e., 47 facilities.

EPA's guidance for conducting risk assessments[1] calls for development of both a central tendency risk estimate and a high-end risk estimate. The central tendency estimate is intended to produce an estimate that is based on most likely values of all component parameters. The high-end estimate is intended to correspond to the high-end portion of the risk distribution, i.e., it is based on conservative values for input parameters. For this RIA, one of the factors that is most important in determining risk is constituent concentration in the waste, and there is considerable uncertainty in the concentrations reported in the TC Survey. For this reason, the Agency developed central tendency and high-end estimates of ground-water risk based on varying the constituent concentrations in the waste.

[1]U.S.EPA. *Guidance on Risk Characterization for Risk Managers and Risk Assessors.* EPA Risk Assessment Coun Memorandum dated February 26, 1992.

The central tendency and high-end estimates differ in two ways.

- One of the survey questions called for information on waste concentrations, and did not specify whether respondents should report bulk concentration or concentration in the TCLP extract. Based on the concentration values and the units that were reported, it appeared that many respondents reported bulk (total) concentrations. For the central tendency estimate, EPA interpreted—based on the units and the concentrations that were reported—that some of the responses applied to bulk concentrations . For the high-end estimate, EPA assumed that all responses are in terms of TCLP concentration.

- The survey asked for average, minimum, and maximum concentrations. For the central tendency, EPA used average concentrations where they were reported, and maximum concentration divided by 2 otherwise. For the high end, EPA used the maximum concentration where reported, and average concentration otherwise.

Each of the two sets of waste concentration estimates were carried through the remaining steps of the risk analysis (note that step 2 pertains only to the central tendency estimate).

Step 2. Where respondents reported total concentrations, rather than TCLP concentrations, use the OLM to predict leachate concentrations. EPA assumed that the TCLP accurately predicts long-term leaching behavior of wastes in the environment, i.e., that the TCLP leachate concentration is equal to the long-term average leachate concentration. For the central tendency scenario, in situations where EPA believed that survey responses were probably in terms of total (bulk) waste concentration rather than TCLP concentrations, EPA used the OLM to predict leachate concentrations. EPA has used this technique in a variety of other applications, including the delisting program and several other RIAs. The OLM equation may be represented as

$$L = C^{0.678} \times S^{0.373} \times 0.00211 \quad (1)$$

where L is the leachate concentration [mg/l], C is the bulk waste concentration [mg/kg], and S is the constituent water solubility [mg/l].

Appendix G provides the calculated leachate concentrations for each constituent at each of the sample facilities, under the central tendency scenario.

Step 3. Calculate the mean concentration of each constituent at each facility, weighted across the tonnage of all TC wastes managed at that facility. EPA assumed that, at each facility, all TC wastes would be managed in the same landfill unit, and that the average concentration for the unit would be the weighted average across all of the TC wastes. Note that in some cases TC wastes are co-disposed with other wastes; nevertheless, for purposes of this analysis, EPA did not attempt to evaluate complex interactions with non-TC wastes.

Step 4. Calculate the risk that would be posed by consumption of leachate, for both cancer and non-cancer effects, at each facility. EPA assembled values for oral toxicity from its Integrated Risk Information System (IRIS), for both cancer and non-cancer effects. Using standard assumptions for body weight (70 kg), water intake (2 liters per day), and exposure duration (nine years), EPA calculated the cancer risk that would be posed by drinking undiluted leachate at each facility. For non-carcinogens, the Agency calculated the hazard index, i.e., the ratio of exposure dose to the reference dose. Within each facility, EPA summed the cancer risk across constituents, and the hazard index across constituents. This yielded values for risk, at the facility level, prior to any accounting for fate and transport processes.

In general, for each facility, one constituent dominated all others in terms of risk. Exhibit 5-1 presents the principal constituents posing cancer risk in the central tendency baseline for each of the 36 sample facilities. It also provides their post-regulatory leachate concentrations (i.e., the universal standard). Central tendency concentrations for all constituents are provided in Appendix G. Note that at 25 of the 36 facilities (70 percent), the risk-driving constituent is benzene. No other constituent appears more than twice as the principal risk-driver. Exhibit 5-2

EXHIBIT 5-1

BASELINE (CENTRAL TENDENCY) AND POST-REGULATORY LEACHATE CONCENTRATIONS FOR CANCER RISK DRIVERS

FACILITY NUMBER	CONSTITUENT	BASELINE CONCENTRATION (mg/l)	POST-REGULATORY CONCENTRATION (mg/l)	FACILITY NUMBER	CONSTITUENT	BASELINE CONCENTRATION (mg/l)	POST-REGULATORY CONCENTRATION (mg/l)
1	VINYL CHLORIDE	10.097	0.140	19	BENZENE	0.999	0.160
2	BENZENE	3.298	0.160	20	BENZENE	0.800	0.160
3	BENZENE	24.912	0.160	21	BENZENE	0.500	0.160
4	1,1-DICHLORO-ETHYLENE	0.301	0.130	22	BENZENE	2.553	0.160
5	BENZENE	42.202	0.160	23	DICHLOROETHYL ETHER	0.354	0.220
6	BENZENE	983.903	0.160	24	CARBON TETRACHLORIDE	0.555	0.084
7	BENZENE	0.624	0.160	25	BENZENE	0.346	0.160
8	1,2-DICHLORO-ETHANE	56.067	0.210	26	BENZENE	5.809	0.160
9	BENZENE	1.157	0.160	27	BENZENE	1.110	0.160
10	BENZENE	1.400	0.160	28	BENZENE	2.000	0.160
11	2,4-DINITRO-TOLUENE	3.634	0.880	29	BENZENE	187.630	0.160
12	1,1-DICHLORO-ETHYLENE	11.197	0.130	30	1,2-DICHLORO-ETHANE	7.685	0.210
13	POLY-CHLORINATED BIPHENYLS	37.199	0.003	31	BENZENE	3.359	0.160
14	BENZENE	0.691	0.160	32	BENZENE	15.000	0.160
15	BENZENE	16.542	0.160	33	BENZENE	1.811	0.160
16	PENTACHLORO-PHENOL	6.151	0.022	34	BENZENE	5.000	0.160
17	BENZENE	0.346	0.160	35	BENZENE	0.489	0.160
18	1,1-DICHLORO-ETHYLENE	1.274	0.130	36	BENZENE	10.000	0.160

Note: Data presented in this exhibit have been computer generated and contain non-significant figures.

presents similar information for the constituents dominating non-cancer risk. Only 16 of the 36 sample facilities had constituents contributing to non-cancer risks; the remaining 20 facilities were assumed to have no non-cancer risks. At two of the 16 facilities, the non-cancer risk-driver was an inorganic metal (e.g., nickel). At two other facilities, the risk-driver was an organic chemical that was not regulated under the TC rule (toluene, ethylbenzene).

Step 5. Use a dilution/attenuation factor (DAF) to represent the effect of fate and transport processes in a ground-water system. In this step, EPA divided the facility risk by the DAF distribution to yield a frequency distribution of predicted risks at exposure wells. The DAF distribution used in this analysis was determined by scaling the DAF distribution used in the TC rule[2] to reflect the effect of Subtitle C containment, after some level of system failure.

There are several important timing assumptions that are implicit in the use of the DAF distribution. First, as previously mentioned, the releases are assumed to occur at some point in the future when the containment systems fail; this is likely to be at least 30 years after installation of the cover and liner. Second, the approach assumes that the releases occur after ground-wa monitoring and corrective action have ceased; otherwise, these activities would be likely to reduce the baseline risk at most facilities. Third, the DAF distribution was developed using a steady-state model; the model predicts concentrations at a downgradient well, assuming that there is an infinite source of contaminant in the waste. The model predicts equilibrium concentrations at the well, i.e., concentrations after the constituent has had sufficient time to travel downgradient. The time needed to attain this equilibrium can vary from months to millennia, depending on ground-water velocity, distance to the exposure well, and the retardation factor of the contaminant (i.e., the velocity of the contaminant relative to the ground water that is carrying it). The benefit analysis is oriented to long-term benefits; as this discussion makes clear, the baseline risks may be posed over a period of decades to centuries. Nevertheless, for the TC rule the infinite source and steady-state assumptions were deemed reasonable by the Agency for purposes of regulating TC constituents, and for the Phase II LDR RIA they are reasonable for estimating the potential benefits due to related ground-water contamination in the long term.

[2]This distribution is based on the facility, environmental, and exposure characteristics of municipal (i.e., Subtitle D landfills.

EXHIBIT 5-2

BASELINE (CENTRAL TENDENCY) AND POST-REGULATORY LEACHATE CONCENTRATIONS FOR NON-CANCER RISK DRIVERS

FACILITY NUMBER	CONSTITUENT	BASELINE CONCENTRATION (mg/l)	POST-REGULATORY CONCENTRATION (mg/l)
4	CHLOROBENZENE	43.7	0.070
5	PYRIDINE	0.96	0.72
6	TOLUENE	9038.8	0.11
8	CARBON TETRACHLORIDE	3.3	0.084
10	NICKEL	2.0	5.0
11	NITROBENZENE	2.3	0.21
12	CHLORDANE	0.16	0.00068
13	PYRIDINE	3.8	0.72
15	CHLORDANE	0.010	0.00068
16	NICKEL	1019.2	5.0
18	NITROBENZENE	1.5	0.21
23	CHLOROFORM	13.6	0.21
24	CARBON TETRACHLORIDE	0.55	0.084
30	TETRACHLOROETHYLENE	0.060	0.046
31	ETHYLBENZENE	2.9	0.066
32	METHYL ETHYL KETONE	50.0	2.5

Note: Data presented in this exhibit have been computer generated and contain non-significant figures.

To account for the effect of Subtitle C containment (e.g., cover and liners), EPA assumed that in any environmental setting, the DAF is inversely proportional to the infiltration rate. For the Corrective Action RIA, EPA developed a set of estimates of the effectiveness of caps and liners. The Agency estimates that about 30 years after installation a Subtitle C cap is about 80 percent effective and a liner is about 85 percent effective. Thus, the liner would be the limiting factor for net infiltration through the landfill. Using the figure of 85 percent effectiveness, the percentage of infiltration passing through the landfill would be 100 percent less 85 percent, or 15 percent. Thus, multiplying calculated infiltration by 0.15 would reflect the effect of Subtitle C containment that is no longer at peak effectiveness. This approach assumes that after about 30 years after the operating period ends, the owner/operator no longer inspects the cap, nor does anyone replace or repair the cap.

The table below displays the upper quartile of the DAF distribution used in this analysis, including both the set of DAFs developed for the TC rule (which addressed management of wastes in Subtitle D facilities), and the adjusted set used for this RIA (i.e., the values from the TC rule divided by a factor of 0.15 to account for the effectiveness of a Subtitle C containmen system over the very long term). The set of DAFs used to simulate baseline conditions at Subtitle C units are higher than those for the Subtitle D units, indicating a higher level of protection in the Subtitle C units than in the Subtitle D units.

Dilution/Attenuation Factors (DAFs) Used in the RIA.

Percentile	Original DAF (from TC rule)	Adjusted DAF
99	2.6	17
95	12	82
90	47	315
85	134	900
80	329	2,200
75	830	5,560

Additionally, to estimate distributions of individual risks, EPA assumed that 23 percent of the facilities have downgradient exposure wells. This is based on Subtitle C data from the

Corrective Action RIA database,[3] which covers facility-specific information collected for a stratified random sample of 79 facilities. The data indicate that 23 percent of treatment, storage, and disposal facilities had downgradient private or public wells in the direction of ground-water flow.[4] To account for this, EPA scaled its risk estimates by assuming that the DAFs apply only at 23 percent of the facilities, and at all others there is no human exposure via ground water.

Step 6. Portray the full range of waste concentrations, environmental settings, and exposure conditions at facilities managing TC wastes by dividing the distribution of risks posed by consumption of leachate by the DAF distribution to yield a predicted risk distribution at exposure wells across all facilities managing untreated TC wastes. This step was conducted by using SAS software to combine DAF and facility leachate risk distributions to generate a nationwide distribution of ground-water risks associated with facilities managing TC nonwastewaters. (See Exhibit 5-3 for a graphic representation of this step). The DAF distributions were not sampled randomly (e.g., with a Monte Carlo approach) but rather at predetermined intervals, i.e., at two percent intervals across the entire frequency distribution. These were combined with each of the discrete facility-specific leachate risk values to produce 1,800 risk estimates (i.e., 36 leachate risks divided by 50 DAFs each). These values were used to generate an intermediate individual risk output distribution covering the full range of DAFs and waste characteristics reported at facilities. Note that these individual risk distributions represent risks to a hypothetical receptor, and not to real people.

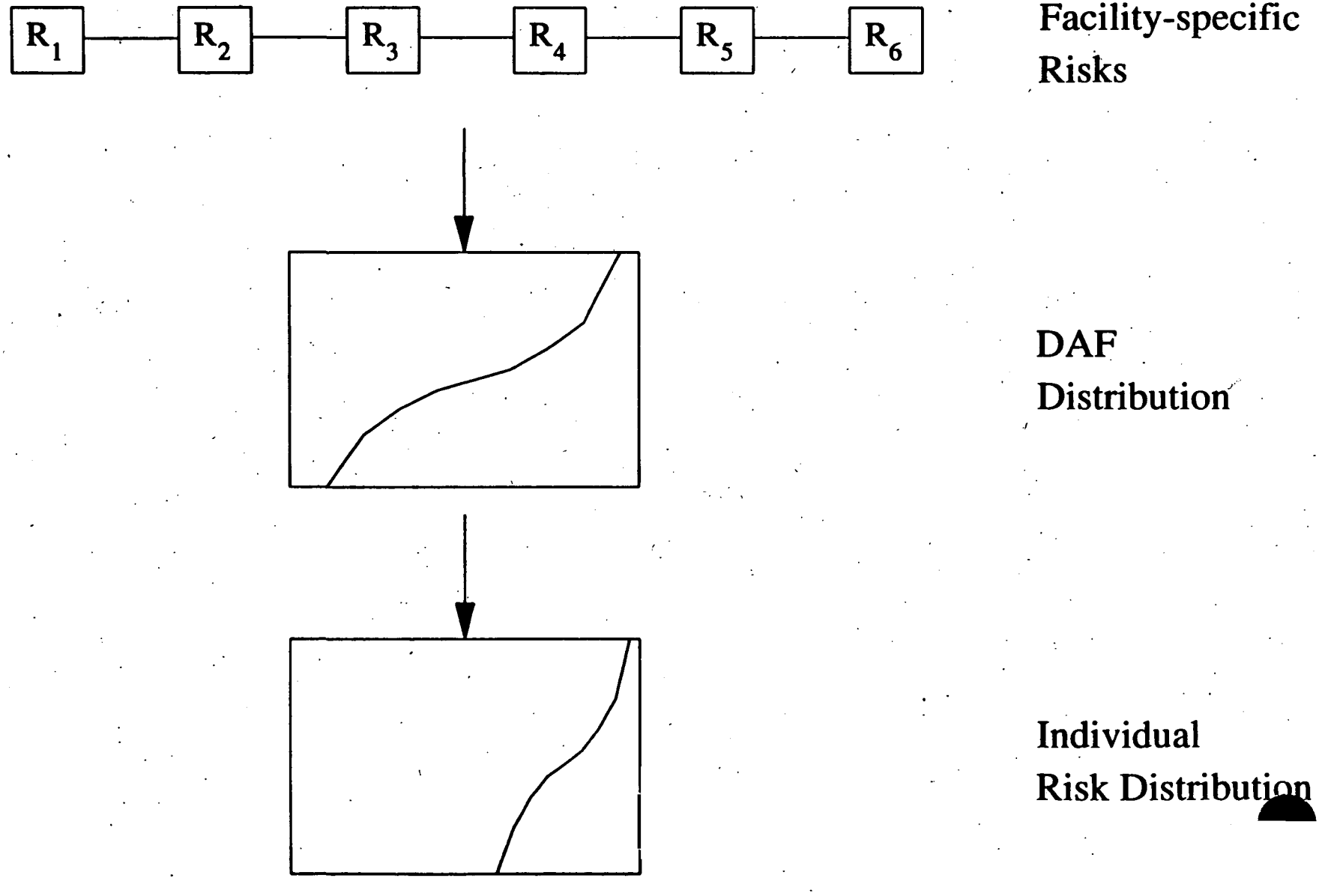
As discussed under Step 5, the Agency assumed that only 23 percent of the facilities were expected to have down-gradient wells. However, the facilities without down-gradient exposures (i.e., 77 percent) could not be identified on a site-specific basis because the available data on downgradient wells provided only the overall percentages. To account for this when calculating probability distributions for individual risk, EPA assumed that the intermediate distribution derived from all 36 facilities applied only to the upper 23 percent of the final distribution. In

[3] *Draft Regulatory Impact Analysis for the Final Rulemaking on Corrective Action for Solid Waste Management Units*, Office of Solid Waste, March 1993.

[4] This figure excludes facilities where large surface water bodies or other ground-water divides are likely to prevent a contaminant plume moving off-site from reaching a well.

Exhibit 5-3

Organization of Individual Risk Analysis



other words, all individual risks below the 77th percentile of the final distribution were assumed to be zero (because of no exposures), the first percentile value from the intermediate distribution corresponds to (approximately) the 78th percentile of the final distribution, and the 100th percentile of the intermediate distribution would be equivalent to the 100th percentile of the final distribution.

Step 7. Using the same framework as for the baseline calculations, develop a distribution of risks for facilities managing TC wastes for the post-regulatory scenario. The post-regulatory scenario assumes that all hazardous constituents will be treated to universal standards, and that the wastes will be disposed of in Subtitle D landfills following treatment.

EPA assumed that the post-regulatory leachate concentration would be equal to the universal treatment standard (UTS). For each constituent, EPA determined the UTS. If the UTS was lower than the baseline concentration, the UTS was used as the leachate concentration. These post-regulatory leachate concentration values were divided by their toxicity benchmarks and summed by facility, as described earlier for step 4, to calculate risks that would correspond to drinking leachate at each facility.

These risks were then combined with a DAF distribution to generate a distribution of risks at exposure wells. As discussed earlier, the DAF distribution for the baseline analysis was calculated by adjusting the DAF distribution used in the TC identification rule to reflect the effect of Subtitle C containment. Because post-treatment disposal would not be in a Subtitle C unit, EPA used the TC rule's DAF distribution when calculating post-regulatory exposure concentrations.

For the post-regulatory scenario, there is no difference in the central tendency estimate and the high-end estimate, i.e., they both use the same sets of waste concentrations.

Population Risks

EPA's approach for estimating population risks involves nine steps:

(1-5) Develop concentration data from the TC survey to represent waste concentrations and calculate the risk posed by consumption of the leachate, and use a dilution/attenuation

factor (DAF) to represent the effect of fate and transport processes in a ground-water system. These steps are identical to the first five steps used to calculate individual risks.

(6) Calculate the population exposed to ground water at each of the 36 facilities.

(7) Integrate the risk level over the exposed population and DAF distribution to calculate population risks for each facility.

(8) Calculate total population risks for the affected universe of facilities.

(9) Calculate total population risks under for the post-regulatory scenario and develop incremental benefit estimates for the rule..

As noted, the first five steps are identical to those use to calculate individual risks. The following discussion details steps six through nine.

Step 6. Calculate the population exposed to ground water at each of the 36 facilities. Although EPA had population density data for the Phase II LDR sample facilities, data on populations exposed to ground water were not available. However, EPA had both population density and exposed population data for sample facilities included in the Corrective Action RIA. EPA combined these data sources, as shown in Exhibit 5-4, to estimate the population exposed to ground water at each facility, using the following three steps:

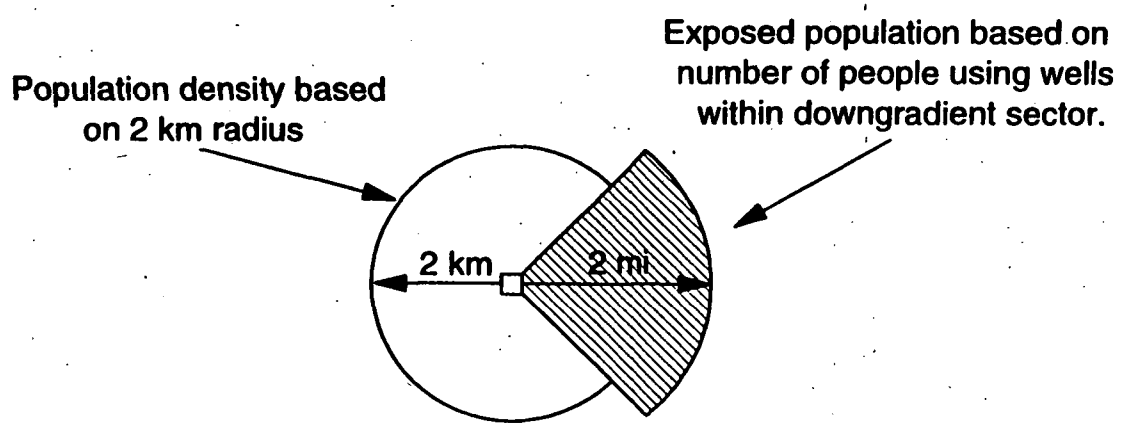
(1) Using data in the GEMS database, EPA calculated the local (i.e., within 3 km) population density for each of the 36 facilities.

(2) Using data collected for the Corrective Action RIA, EPA examined the relationship between the local population density and the population exposed to ground water. For each of 52 facilities included in the Corrective Action RIA sample, EPA determined the local population density within 2 km (population

Exhibit 5-4
Availability of Population Density and Ground-water Exposure Data

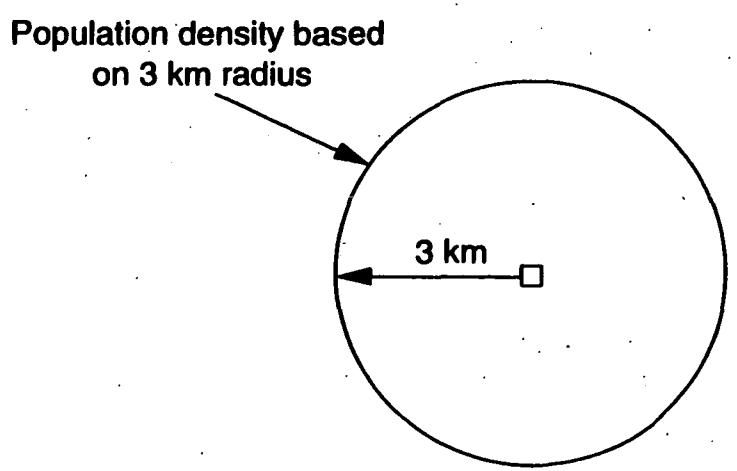
Corrective Action Sample Facility

Data available for population density and exposed population.



Phase II LDR Sample Facility

Data available only for population density.



density data was not available to 3 km) and the total exposed population. The total exposed population was determined by identifying all public and private wells located in a 90 degree sector in the direction of ground-water flow within a two mile radius of the facility. For many facilities, the exposed population was zero.[5]

Based on these data, EPA determined an average ratio of exposed population to total population within the 90 degree ground-water exposure sector for low-density (less than 1,000 people per square kilometer) and high-density (more than 1,000 people per square kilometer) settings. For each case, the average exposed population was calculated by averaging all exposed population values (including zero exposure values). Similarly, the average total population was calculated by averaging the facility-specific populations (calculated as the product of the density and the sector area). For low-density settings, EPA estimated that the population exposed via ground water would be approximately 0.4 times the total population. For high-density settings, EPA estimated that the population potentially expose via ground water would be approximately 0.05 times the total population. The exposed population in high-density areas is less than in low-density areas because these areas are more likely to use public water supplies drawing from sources sufficiently distant from the contaminant source to not be impacted.

(3) EPA multiplied the facility-specific total populations within the ground-water exposure sector for the 36 sample facilities by the exposure ratios to estimate the hypothetical exposed population for each facility.

Step 7. Integrate the risk level over the exposed population and DAF distribution to calculate population risks for each facility. For all facilities, EPA sampled the DAF distribution over 100 intervals (i.e., at each percentile) to generate a series of 100 DAF values. Then, for each facility, EPA multiplied the leachate risk level by the DAF and the incremental population

[5]The method for estimating individual risk accounts for situations where there are no downgradient wells by adjusting the DAF distribution (see step 5, above). For estimating population risks, facilities with no downgradient wells are included in the computation of average well-using population density.

(i.e., 1/100th of the total population) and summed over all increments to calculate the total population risk level. (See Exhibit 5-5 for a graphic representation of this step).

Step 8. Calculate total risks for the affected universe. EPA estimated cancer and non-cancer effects for the affected universe based on the facility-specific risk levels, using the following approach:

- For cancer risks, EPA first summed the 36 facility-specific values. This value was then multiplied by (47/36) to scale from the 36 modeled facilities to the 47 facilities in the affected universe.

- For non-cancer effects, EPA examined the DAF-adjusted ratio of the exposure concentration to the appropriate threshold value for each of the 36 facilities. If the ratio exceeded unity, EPA assumed the entire population to be exposed; otherwise, EPA assumed the exposed population to be zero. EPA then summed these populations and scaled up the total to represent 47 facilities.

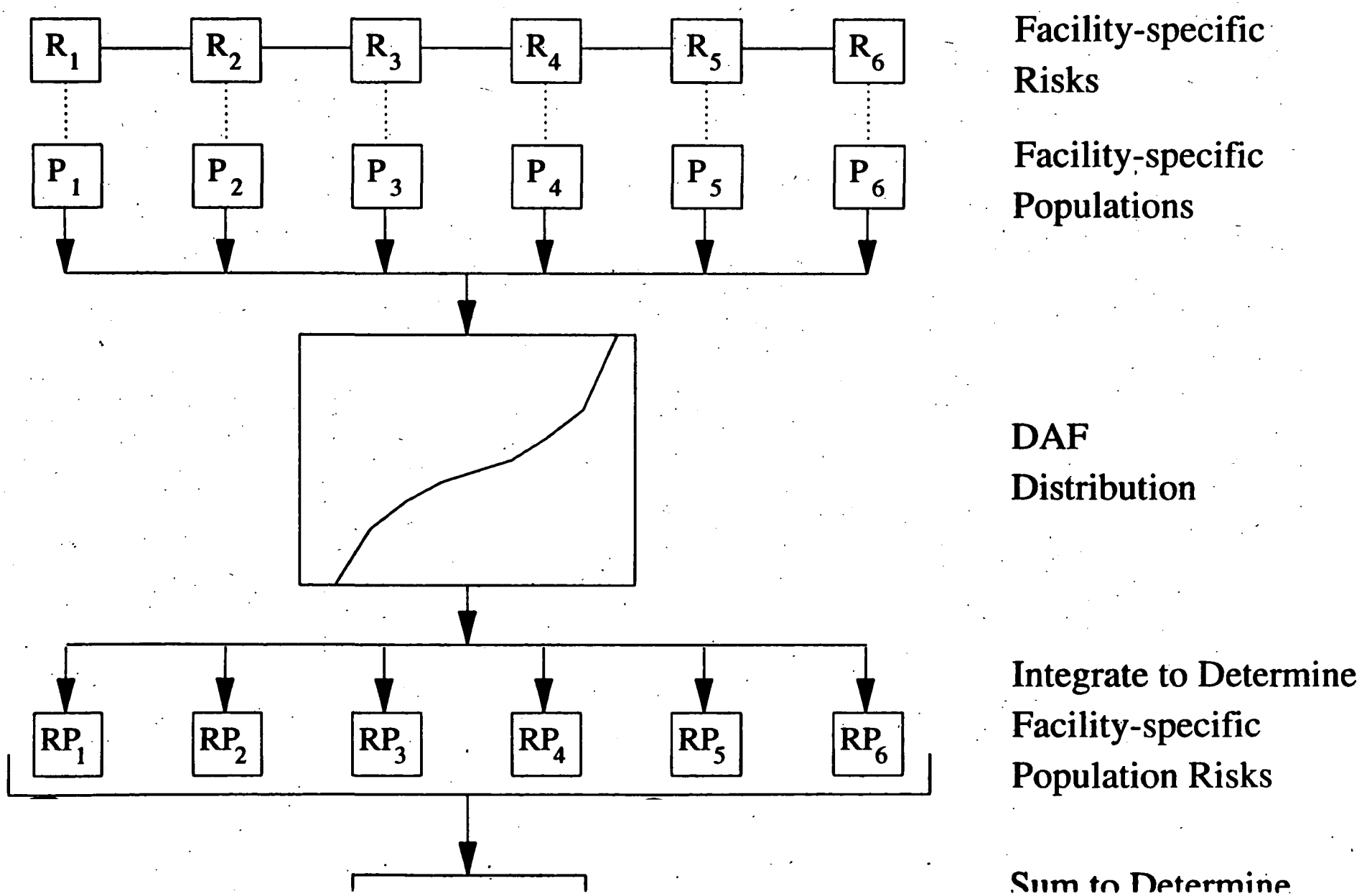
Step 9. Calculate risks for the post-regulatory scenario and calculate incremental benefit estimates. Using the same approach used to calculate baseline risks, EPA calculated post-regulatory risks using the same assumptions used for the individual-risk analysis. Note that because the effectiveness of containment is assumed to be less in the post-regulatory case (Subtitle D) than in the baseline case (Subtitle C), post-regulatory risks may actually rise if treatment does not significantly decrease the leachate concentration. The post-regulatory risk was then subtracted from the baseline scenarios to estimate the incremental benefit.

5.1.2 Results

This section presents results for the baseline risks (under both central tendency and high-end assumptions) and the post-regulatory scenario. For each case, distinct results for individual cancer and non-cancer risk are presented. The section concludes with population risk estimates.

Exhibit 5-5

Organization of Population Risk Analysis



Individual Risks

Exhibit 5-6 presents the estimates of the baseline and post-regulatory individual cancer risk across all facilities. The results are presented in terms of a cumulative frequency distribution indicating the percentile level associated with an individual risk level across all facilities. These individual risk values represent the 1,800 different combinations of facilities and DAFs that were statistically combined for this analysis, which have been compressed over the top 23 percent of the distribution to account for facilities with no downgradient wells. As the exhibit shows, the high-end baseline risk estimate is between one and two orders of magnitude higher than the central tendency estimate across the distribution. About ten percent of the individual risk values indicate baseline lifetime excess individual cancer risk exceeding 10^{-6} under high-end assumptions, with almost five percent exceeding 10^{-4}. About six percent of the individual risk values exceed 10^{-6} in the baseline using central tendency assumptions, including about two percent which exceed 10^{-4}. In the post-regulatory case, about five percent of the individual risk values indicate excess cancer risks above 10^{-6}, and about one percent of the risk values exceed 10^{-4}. A single-value (i.e., not a distribution) estimate for central tendency risk may be estimated as the 50th percentile of the central tendency curve, i.e., zero because most facilities are not expected to have downgradient wells. Similarly, a single-value estimate for high-end risk may be estimated as the 90th percentile of the high end curve, i.e., approximately 2.0×10^{-7}.

Exhibit 5-7 presents the estimated baseline and post-regulatory non-cancer risk. Using central tendency assumptions, the 99th percentile baseline exposure level is less than the reference dose. Under high-end assumptions, about two percent of the distribution exceeds a hazard index of unity, indicating the potential for adverse non-cancer effects. Post-regulatory non-cancer risk, however, is insignificant.

Population Risks

Population cancer risks are presented in Exhibit 5-8. The estimated baseline population cancer risk is 0.24 cases per year for the central tendency scenario. The post-regulatory population cancer risk is about 0.022 cases per year. In other words, the rule reduces 0.22 cancer

EXHIBIT 5-6

Cancer Risk
Via the Ground-Water Pathway

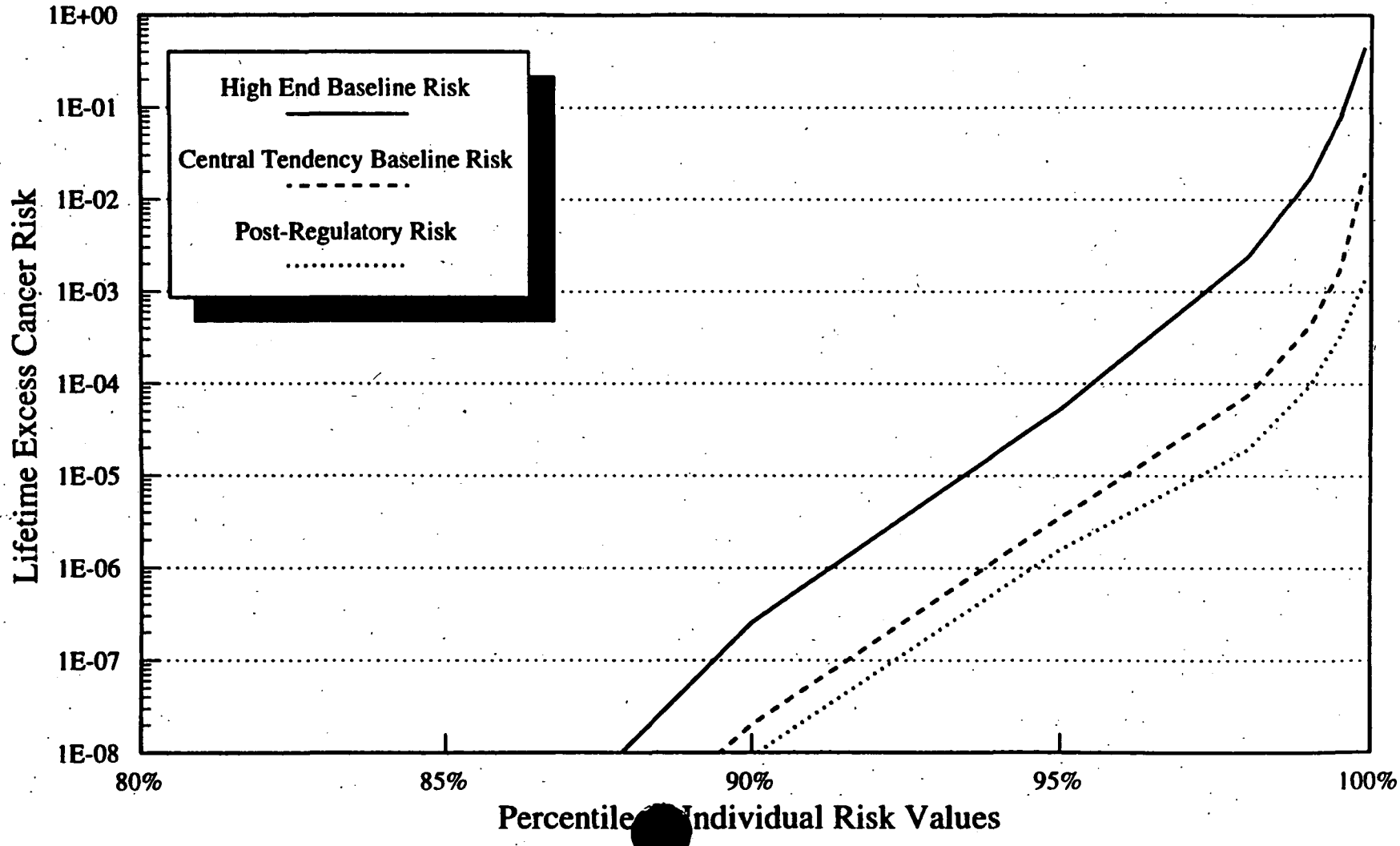


EXHIBIT 5-7

Non-Cancer Risk
Via the Ground-Water Pathway

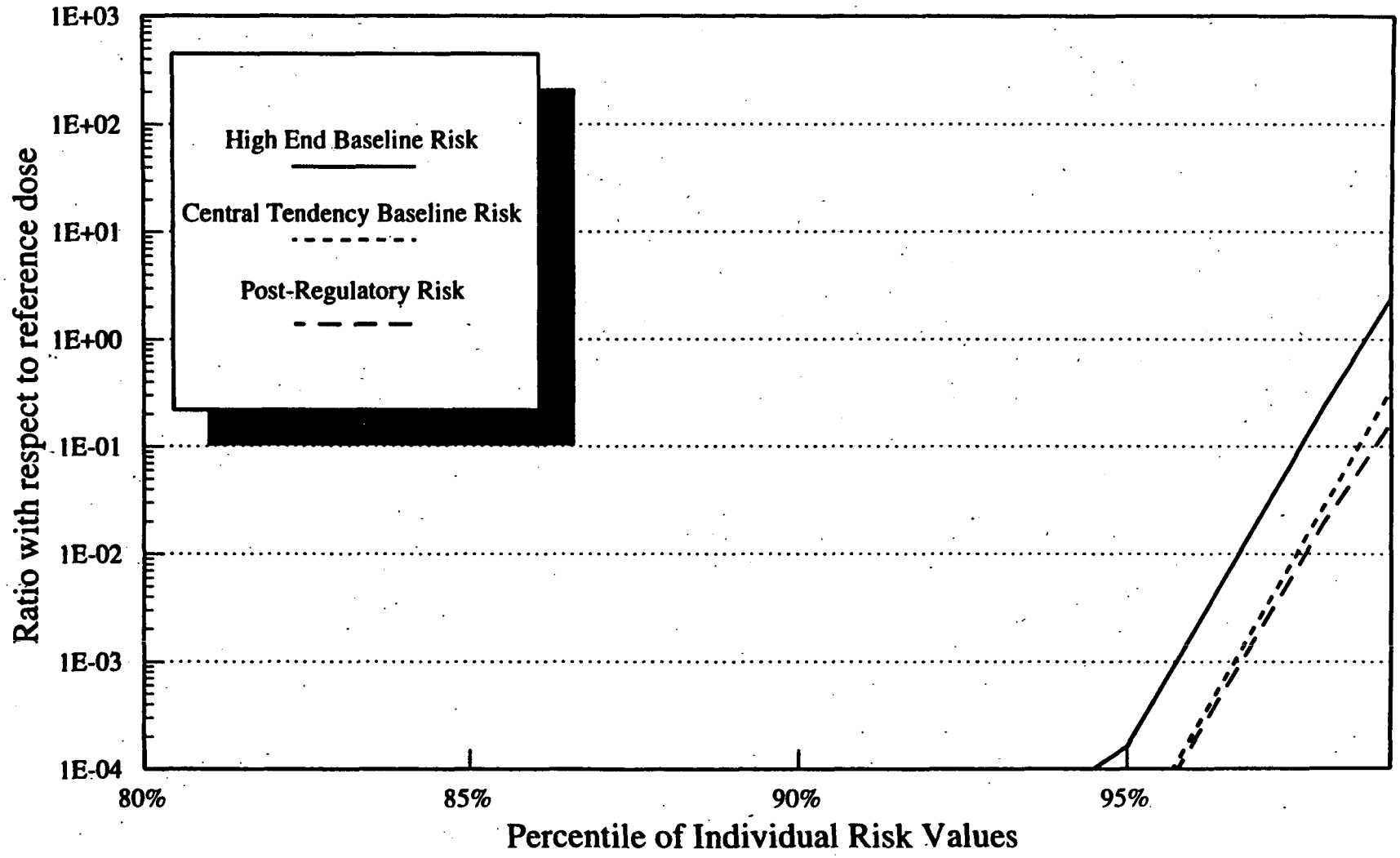


EXHIBIT 5-8 - POPULATION GROUND-WATER CANCER RISKS

FACILITY ID	EXPOSED POPULATION	CANCER RISK				
		TOTAL			INCREMENTAL	
		CEN. TEN.	HIGH END	POST-REG	CEN. TEND.	HIGH END
1	664	0.01	0.01	0.00	0.01	0.01
2	3113	0.00	0.00	0.00	0.00	0.00
3	744	0.00	0.00	0.00	0.00	0.00
4	1418	0.00	0.00	0.00	-0.00	-0.00
5	615	0.00	0.00	0.00	0.00	0.00
6	1315	0.03	2.33	0.00	0.03	2.33
7	2250	0.00	0.00	0.00	-0.00	-0.00
8	601	0.00	0.01	0.00	0.00	0.01
9	1442	0.00	0.00	0.00	0.00	0.00
10	1442	0.00	0.00	0.00	0.00	0.00
11	2462	0.01	0.54	0.01	-0.00	0.53
12	0	0.00	0.00	0.00	0.00	0.00
13	597	0.13	0.14	0.00	0.13	0.14
14	53	0.00	0.00	0.00	-0.00	0.00
15	647	0.00	0.19	0.00	-0.00	0.19
16	246	0.00	0.23	0.00	-0.00	0.23
17	13163	0.00	0.01	0.00	-0.00	0.01
18	577	0.00	0.34	0.00	0.00	0.34
19	1550	0.00	0.00	0.00	0.00	0.00
20	1158	0.00	0.00	0.00	-0.00	0.00
21	0	0.00	0.00	0.00	0.00	0.00
22	1599	0.00	0.00	0.00	0.00	0.00
23	684	0.00	0.00	0.00	-0.00	-0.00
34	1199	0.00	0.01	0.00	0.00	0.01
25	2377	0.00	0.00	0.00	-0.00	0.00
26	0	0.00	0.00	0.00	0.00	0.00
27	578	0.00	0.10	0.00	0.00	0.10
28	1745	0.00	0.00	0.00	0.00	0.00
29	916	0.00	0.02	0.00	0.00	0.02
30	817	0.00	0.02	0.00	0.00	0.02
31	2909	0.00	0.00	0.00	0.00	0.00
32	759	0.00	0.03	0.00	0.00	0.03
33	827	0.00	0.00	0.00	0.00	0.00
34	1002	0.00	0.01	0.00	0.00	0.01
35	503	0.00	0.00	0.00	-0.00	0.00
36	503	0.00	0.00	0.00	0.00	0.00
	TOTAL	0.18	4.01	0.02	0.17	3.99
	SCALED	0.24	5.23	0.02	0.22	5.21

Note: Data presented in this exhibit have been computer generated [illegible]tain non-significant figures.

cases per year with respect to the central tendency baseline, that is, 92 percent of the baseline cancer cases. Note that for some specific facilities, the post-regulatory risks are higher than in the baseline. This is because the reduction in risk effected by treatment was less than the increase in risk associated with Subtitle D, rather than Subtitle C, disposal.

Population risks for non-cancer effects are presented in Exhibit 5-9. Two of the 36 facilities had exposure-to-threshold ratios above unity in the baseline case, resulting in a total scaled population of 2,038. In the post-regulatory scenario, however, no facilities exceeded a ratio value of unity. Therefore, all of the non-cancer baseline risk is eliminated.

5.2 HUMAN HEALTH RISK REDUCTION — AIR PATHWAY

Constituents contained in TC waste, soil, and debris may be emitted to air through volatilization or dust entrainment. Reducing the concentrations of TC constituents according to the Phase II LDR treatment standards would significantly reduce the potential for air emissions, and the risks posed by those air emissions. The goal of the air pathway risk analysis is to characterize baseline risk and the reduction in baseline risk resulting from the Phase II LDR rule. This analysis focuses on the benefits in average or expected situations. In more extreme cases (e.g., catastrophic meteorological conditions or emissions from explosions) the benefits of the rule would be greater.

5.2.1 Approach

The Agency's approach employed seven steps:

(1) Develop bulk waste concentration data from the TC capacity database to represent waste concentrations.

(2) In cases where respondents reported TCLP concentrations, rather than bulk concentrations, use the Organic Leaching Model (OLM) to back-calculate bulk concentrations.

EXHIBIT 5-9 - POPULATION GROUND-WATER NON-CANCER EFFECTS

		NON-CANCER RISK					
		RATIOS			AFFECTED POPULATION		
FACILITY ID	EXPOSED POPULATION	CEN. TEND.	HIGH END	POST REG	CEN. TEND.	HIGH END	POST REG
1	664	0	0	0	0	0	0
2	3113	0	0	0	0	0	0
3	744	0	0	0	0	0	0
4	1418	0.18	0.18	0.20	0	0	0
5	615	0.05	0.08	0.24	0	0	0
6	1315	2.45	2.45	0.05	1315	1315	0
7	2250	0	0	0	0	0	0
8	601	0.39	0.88	0.09	0	0	0
9	1442	0	0	0	0	0	0
10	1442	0.01	0.16	0.08	0	0	0
11	2462	0.33	11.66	0.30	0	2462	0
12	0	0.25	0.47	0.02	0	0	0
13	597	0.19	0.35	0.25	0	0	0
14	53	0	0	0	0	0	0
15	647	0.01	0.49	0.02	0	0	0
16	246	2.86	17.28	0.14	246	246	0
17	13163	0	0	0	0	0	0
18	577	0.26	181.11	0.20	0	577	0
19	1550	0	0	0	0	0	0
20	1158	0	0	0	0	0	0
21	0	0	0	0	0	0	0
22	1599	0	0	0	0	0	0
23	684	0.07	0.07	0.01	0	0	0
34	1199	0.10	12.78	0.19	0	1199	0
25	2377	0	0	0	0	0	0
26	0	0	0	0	0	0	0
27	578	0	0	0	0	0	0
28	1745	0	0	0	0	0	0
29	916	0	0	0	0	0	0
30	817	0.00	0.02	0.00	0	0	0
31	2909	0.00	0.02	0.01	0	0	0
32	759	0.00	0.08	0.00	0	0	0
33	827	0	0	0	0	0	0
34	1002	0	0	0	0	0	0
35	503	0	0	0	0	0	0
36	503	0	0	0	0	0	0
				TOTAL	1561	5799	0
				SCALED	2038	7571	0

Note: Data presented in this exhibit have been computer generat[illegible] contain non-significant figures.

(3) Calculate the mean concentration of each constituent at each facility, weighted across the volume of all TC wastes managed at that facility.

(4) Calculate the unit area where TC wastes are managed.

(5) Estimate emissions due to volatilization and dust entrainment for each constituent at each facility.

(6) Using an integrated atmospheric dispersion/exposure/risk model, evaluate atmospheric transport for each constituent. Estimate exposures for each constituent at a series of downwind points corresponding to potential exposure locations. Calculate individual and population cancer and non-cancer risk.

(7) Simulate the post-regulatory scenario.

The following discussion is keyed to the steps listed above.

Steps 1 through 3. Calculate constituent concentrations. The approach for these steps is essentially identical to that described for the ground-water risk analysis in section 5.1.1, except that EPA used total concentrations rather than TCLP concentrations in the air analysis. Exhibit 5-10 presents the facility-averaged waste concentrations for each constituent at each facility, for both the baseline and post-regulatory scenarios.

Step 4. Calculate the unit area where TC wastes are managed. EPA assumed that (1) nonwastewater TC wastes are managed in landfills, (2) landfills have a working depth of 4 m, and (3) the working area can be calculated by dividing annual waste volume (in m^3) by 4 m. Unit area is an input to the emission calculations and dispersion calculations in steps 5 and 6, respectively.

Step 5. Estimate emissions due to volatilization and dust entrainment for each constituent at each facility. EPA used the volatilization algorithms first described in Hwang and Falco (1986)[6] and subsequently adopted in the Risk Assessment Guidance for Superfund (RAGS) and MMSOILS model. This volatilization model is based on a mass balance of the chemical that is transported by diffusion in the vapor phase where the vapor phase and soil adsorbed phases of the chemical are assumed to be in equilibrium. The model is generally used for uncovered sites where the contaminant is adsorbed to the soil. The emission rate, N, is calculated as the average emission rate over a time interval, from time equals 0 to t, as

$$N = \frac{2\, D_i\, \theta^{4/3}}{\sqrt{\pi \alpha t}} \times \frac{H}{K_d} \times \frac{C_s}{XF1} \qquad (2)$$

The effective diffusion parameter is calculated as

$$\alpha = \frac{D_i \theta^{4/3}}{\theta + \rho_s (1-\theta)\, \dfrac{K_d}{H}} \qquad (3)$$

The definitions and values of parameters are as follows:

C_s	=	adsorbed chemical concentration in soil (1,000 mg/kg)
D_i	=	diffusion coefficient of compound in air (0.1 cm^2/s)
H	=	Henry's law constant (0.2294 dimensionless)
K_d	=	soil-water partition coefficient (7.0 ml/g) (using f_{oc} of 0.02 and K_{oc} of 347.6664 ml/g)
N	=	mass flux ($g/s/cm^2$) (calculated)
R	=	gas constant (8.2E-05 [atm m^3]/[mol K]),
t	=	time (sec) (scenario dependent)

[6]Hwang, S.T. and Falco, J.W., "Estimation of Multimedia Exposures Related to Hazardous Waste Facilities," in *Pollutants in a Multimedia Environment*, Y. Cohen (ed.), Plenum Press, 1986.

XF1 = units conversion factor (10^6 mg/kg per g/g),

α = effective diffusion parameter (0.00072 cm^2/s) (calculated)

Θ = porosity (0.437)

ρ_s = particle density of soil (2.65 g/cm^3).

EXHIBIT 5-10

WASTE CONCENTRATIONS USED FOR AIR CALCULATIONS

FACILITY NO.	WASTE VOLUME (m^3)	CONSTITUENT	BASELINE CONCENTRATION (mg/kg)	POST-REGULATORY CONCENTRATION (mg/kg)
1	1,215	BENZENE	168.1	10
		VINYL CHLORIDE	1864.51	6
2	6,879	BENZENE	861.2	10
		TRICHLOROETHYLENE	466.29	6
3	11,400	BENZENE	16993.36	10
4	23,770	1,1-DICHLOROETHYLENE	24.89	6
		1,4-DICHLOROETHANE	10.61	6
		1,4-DICHLOROBENZENE	0.44	0.44
		2,4,6-TRICHLOROPHENOL	0.0021	0.0021
		BENZENE	35.33	10
		CARBON TETRACHLORIDE	25.35	6
		CHLOROBENZENE	81616.73	6
		CHLOROFORM	334.05	6
		HEXACHLOROBENZENE	25.12	10
		METHYL ETHYL KETONE	10521.67	36
		NITROBENZENE	3.17	3.17
		TRICHLOROETHYLENE	21.33	6
		VINYL CHLORIDE	0.0007	0.0007
5	2,004	BENZENE	36975.11	10
6	871	1,2-DICHLOROETHANE	316.02	6
		BENZENE	100000	10
		CARBON TETRACHLORIDE	594.01	6
		CHLOROFORM	274.52	6
		TOLUENE	100000	10
		TRICHLOROETHYLENE	2.69	2.69

EXHIBIT 5-10 (cont.)

WASTE CONCENTRATIONS USED FOR AIR CALCULATIONS

FACILITY NO.	WASTE VOLUME (m^3)	CONSTITUENT	BASELINE CONCENTRATION (mg/kg)	POST-REGULATORY CONCENTRATION (mg/kg)
7	725	1,1-DICHLOROETHYLENE	93.41	6
		1,2-DICHLOROETHANE	24694.3	6
		CARBON TETRACHLORIDE	1223.08	6
		CHLOROFORM	932.73	6
		HEXACHLOROBENZENE	79.86	10
		HEXACHLOROBUTADIENE	212.22	5.6
		HEXACHLOROETHANE	48.53	30
		TRICHLOROETHYLENE	369.43	6
		VINYL CHLORIDE	12.04	6
8	345	BENZENE	183.62	10
9	1,984	1,2-DICHLOROETHANE	28.36	6
		CARBON TETRACHLORIDE	0.39	0.39
		CHLOROBENZENE	0.03	0.03
		NITROBENZENE	469.44	14
		TRICHLOROETHYLENE	0.09	0.09
10	2,792	1,1-DICHLOROETHYLENE	5161.79	6
		1,2-DICHLOROETHANE	560.82	6
		1,4-DICHLOROBENZENE	111.43	6
		BENZENE	2951.75	10
		CHLORDANE	2971.53	0.26
		HEXACHLOROBENZENE	480.68	10
		METHYL ETHYL KETONE	48.58	36
		TRICHLOROETHYLENE	886.09	6

EXHIBIT 5-10 (cont.)
WASTE CONCENTRATIONS USED FOR AIR CALCULATIONS

FACILITY NO.	WASTE VOLUME (m^3)	CONSTITUENT	BASELINE CONCENTRATION (mg/kg)	POST-REGULATORY CONCENTRATION (mg/kg)
11	10,769	1,1-DICHLOROETHYLENE	0.12	0.12
		1,2-DICHLOROETHANE	692.12	6
		1,4-DICHLOROBENZENE	17.24	6
		BENZENE	9383.89	10
		METHYL ETHYL KETONE	68.82	36
		NITROBENZENE	0.0001	0.0001
		TRICHLOROETHYLENE	100000	6
12	1,590	BENZENE	85.94	10
13	6,359	1,1-DICHLOROETHYLENE	0.7	0.7
		1,2-DICHLOROETHANE	1.76	1.76
		BENZENE	9289.93	10
		CARBON TETRACHLORIDE	0.19	0.19
		CHLORDANE	23.93	0.26
		CHLOROFORM	0.00007	0.00007
		HEPTACHLOR	0.31	0.07
		HEXACHLOROBENZENE	2.19	2.19
		HEXACHLOROETHANE	1.56	1.56
		METHYL CHLOROFORM	0.001	0.001
		METHYL ETHYL KETONE	0.6	0.6
		TOLUENE	2.27	2.27
		TRICHLOROETHYLENE	6.94	6
		VINYL CHLORIDE	2.07	2.07
		XYLENES (MIXED)	5.81	5.81

EXHIBIT 5-10 (cont.)

WASTE CONCENTRATIONS USED FOR AIR CALCULATIONS

FACILITY NO.	WASTE VOLUME (m^3)	CONSTITUENT	BASELINE CONCENTRATION (mg/kg)	POST-REGULATORY CONCENTRATION (mg/kg)
14	889	1,2-DICHLOROETHANE	0.01	0.01
		BENZENE	3190.63	10
		CARBON TETRACHLORIDE	10.81	6
		ETHYLBENZENE	2020.78	10
		ETHYLENE DIBROMIDE	0.07	0.07
		METHYL ETHYL KETONE	104.74	36
		METHYLENE CHLORIDE	1.4	1.4
		NICKEL	20384.11	100
		TOLUENE	11652.1	10
		TRICHLOROETHYLENE	516.16	6
		XYLENES (MIXED)	24937.63	30
15	629	BENZENE	30.96	10
16	634	1,1-DICHLOROETHYLENE	209.08	6
		1,2-DICHLOROETHANE	358.72	6
		BENZENE	377.02	10
		CARBON TETRACHLORIDE	21.22	6
		CHLORDANE	102.81	0.26
		CHLOROBENZENE	16.54	6
		ETHYLBENZENE	25.44	10
		HEPTACHLOR	0.13	0.07
		METHYL CHLOROFORM	0.0001	0.0001
		METHYL ETHYL KETONE	274.82	36
		NITROBENZENE	247.69	14
		TOLUENE	109.13	10
		TRICHLOROETHYLENE	67.86	6
		XYLENES (MIXED)	22.27	22.27
17	96,347	BENZENE	147.87	10

EXHIBIT 5-10 (cont.)
WASTE CONCENTRATIONS USED FOR AIR CALCULATIONS

FACILITY NO.	WASTE VOLUME (m^3)	CONSTITUENT	BASELINE CONCENTRATION (mg/kg)	POST-REGULATORY CONCENTRATION (mg/kg)
18	17	BENZENE	106.6	10
19	4,837	1,1-DICHLOROETHYLENE	0.21	0.21
		1,2-DICHLOROETHANE	195.05	6
		BENZENE	0.47	0.47
		CARBON TETRACHLORIDE	0.01	0.01
		CHLOROFORM	2936.03	6
		DICHLOROETHYL ETHER	11.44	6
		HEXACHLOROBENZENE	1.02	1.02
		HEXACHLOROBUTADIENE	0.001	0.001
		HEXACHLOROETHANE	0.003	0.003
		TRICHLOROETHYLENE	0.21	0.21
20	824	BENZENE	118.6	10
		CARBON TETRACHLORIDE	88.04	6
		CHLOROBENZENE	0.05	0.05
		CHLOROFORM	781.5	6
		NITROBENZENE	8.61	8.61
21	780	BENZENE	30.96	10
22	1,322	BENZENE	1984.76	10
23	103	BENZENE	172.91	10
24	1,067	BENZENE	100000	10

EXHIBIT 5-10 (cont.)

WASTE CONCENTRATIONS USED FOR AIR CALCULATIONS

FACILITY NO.	WASTE VOLUME (m^3)	CONSTITUENT	BASELINE CONCENTRATION (mg/kg)	POST-REGULATORY CONCENTRATION (mg/kg)
25	9,342	1,2-DICHLOROETHANE	1317.12	6
		BENZENE	1613.72	10
		METHYL ETHYL KETONE	0.88	0.88
		TRICHLOROETHYLENE	0.92	0.92
		VINYL CHLORIDE	0.01	0.01
		XYLENES (MIXED)	83.85	30
26	384	BENZENE	884.84	10
		ETHYLBENZENE	2567.59	10
		NICKEL	1.22	1.22
		TOLUENE	2550.32	10
		XYLENES (MIXED)	1168.4	30
27	90	BENZENE	8041.19	10
		METHYL ETHYL KETONE	4529.6	36
28	11,015	BENZENE	355.63	10
29	12,000	BENZENE	1590.75	10
30	500	BENZENE	51.61	10
31	1,279	BENZENE	4421.79	10

Note: Data presented in this exhibit have been computer generated and contain non-significant figures.

To predict dust entrainment from wind erosion and vehicular traffic, EPA also used approaches adopted for the MMSOILS model.[7] The equation used to represent the wind erosion of inhalable particulates, PM_{10}, is

$$PM_{10_{wind}} = 0.036 \quad (1-VG) \left(\frac{u_w}{u_t}\right)^3 \quad F(x) \quad A_s \; XF2 \tag{4}$$

The empirical equation used to represent the emission factor for particulates, E_{mv} (kg/VKT), from an uncovered landfill per vehicle kilometers traveled per hour, VKT, is

$$E_{mv} = 0.36 \; (1.7) \; \frac{s}{12} \times \frac{S}{48} \left(\frac{W}{2.7}\right)^{0.7} \left(\frac{w}{4}\right)^{0.5} \frac{(365-pe)}{365} \tag{5}$$

The average hourly emission due to vehicle traffic is then estimated as

$$PM_{10_{veh}} = 1{,}000 \; (g/kg) \times E_{mv} \times VKT \tag{6}$$

Definitions of parameters used in these equations follow:

A_s	= area of site (hectares),
E_{mv}	= emission factor from an unpaved road per vehicle- kilometer of travel (kg/VKT),
F(x)	= plotted function (dimensionless),
PM_{10wind}	= emission rate for inhalable particulates, less than 10 µm, (g/hr), from wind erosion
PM_{10veh}	= emission rate for particulates less than 10 µm, (g/hr), from vehicle traffic

[7]The approach for wind erosion is taken from Cowherd, C. et al., *Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination*, prepared for EPA, Office of Health and Environmental Assessment, 1985. The source of the approach for dust from vehicular traffic (e.g., trucks unloading wastes on a landfill area) is *Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources*, 4 ed., USEPA/OAQPS, 1985.

pe	= number of days per year with at least 0.01 inches of precipitation (days/year),
S	= mean vehicle speed (km/hr),
s	= percent silt content of road surface (percent),
u_w	= mean annual wind speed (m/s),
u_t	= threshold velocity at 7 m height (m/s),
VG	= fraction of contaminated surface with vegetative cover (dimensionless),
VKT	= average vehicle kilometers of travel per hour on unpaved road, (# veh. x km/hr),
W	= mean vehicle weight (Mg),
w	= mean number of wheels per vehicle (#),
x	= dimensionless ratio ($x=0.886\ u_t/u$),
XF2	= units conversion factor ($10^4\ m^2/ha$).

EPA employed a mass balance check to assure that, on an annual basis, the mass emitted through volatilization and particulate entrainment does not exceed the mass disposed of. The Agency limited emissions due to volatilization based on a simple vapor pressure constraint. Specifically, EPA back-calculated the emission rate that would be sufficient to produce vapor saturation given an air flow corresponding to an assumed mixing height of 2 cm, wind velocity of 2.25 m/sec, and unit width calculated as the square root of the unit area. This rate was never limiting; even if the mixing height is reduced to 2 mm, it would limit emissions for only two constituent/facility combinations.

EPA used concentrations from the TC Survey database as input for its calculations on particulate entrainment. EPA assumed that all wastes are similar to soils in terms of properties relevant to volatilization and wind erosion.

Step 6. Evaluate atmospheric transport, exposure, and risk. For this step, EPA relied on GAMS (the Graphical Exposure Modeling System [GEMS] Atmospheric Modeling Subsystem) to evaluate atmospheric transport for each constituent, estimate exposures for each constituent at a series of downwind points corresponding to potential exposure locations, and calculate individual and population cancer and non-cancer risk. The following discussion summarizes the

approach for this step; for a more detailed discussion of GEMS and GAMS, along with an example of the input specifications and model output for a sample facility, see Appendix H.

GAMS provides an automated link between the location of a facility and the meteorologic and population data sets needed to estimate atmospheric dispersion and population risk, respectively. It is based the Industrial Source Complex Model - Long Term (ISCLT) and other widely accepted and frequently applied atmospheric dispersion and risk assessment models. GEMS is housed on the VAX Cluster of computers at EPA's National Computer Center (NCC).

GAMS estimates annual average concentrations, annual exposure, and lifetime and annual cancer risk. For this RIA, EPA modeled the source as a square-shaped area source, with estimated site-specific area as calculated in step 4. Other methods and assumptions include

- Meteorological data. EPA used the facilities' zip codes, as reported in the TC Survey, as the basis for specifying facility locations. GAMS contains data on the centroid of each zip code; for this analysis, EPA assumed that facilities are located at these centroids. The model can identify all nearby "stability array" meteorol stations for which the National Oceanic and Atmospheric Administration has logged data. EPA used meteorological data from the closest available station. The data cover wind speed, wind direction, atmospheric stability, and related factors.

- Exposure assumptions. The Agency assumed that the receptor height is 2 meters above ground level. For most other exposure-related factors, EPA employed the default assumptions used in the model's exposure algorithms, i.e., body weight is 70 kg, inhalation rate is 20 m^3/day, exposure occurs 24 hours per day, indoor air concentrations are equal to outdoor concentrations, and receptors are exposed for the full duration of their lives (70 years). EPA calculated exposures for each constituent at each facility.

- Toxicity data. For carcinogenic constituents, EPA combined the estimated exposures with cancer potency factors to calculate cancer risk (as a probability).

For non-carcinogens, EPA calculated the ratio of the predicted dose to the reference dose (RfDs) – the result is termed the "non-cancer risk ratio." For each site, the Agency summed the cancer risk across all carcinogenic constituents, and the non-cancer ratio across all non-carcinogens.

- Site-specific population data. The Agency used the GEMS Geodata Handling procedure to obtain 1990 census data within the area circumscribed by a radius of 50 kilometers from the facility centerpoint. The 50-km circle is subdivided into 160 sectors, as defined by 16 wind vectors and 10 distances from the source. GAMS calculates the mean annual average concentration for each sector, and, by using the exposure assumptions and risk calculation method described above, estimates the individual risk for receptors in the sector. The model stores information on the geographic centroid of each census tract; the entire population of that tract is assumed to bear the risk for the air modeling sector in which the census tract centroid is located. In this way, EPA calculated the estimated cancer cases (incremental to the background cancer rate due to other causes) for each census tract, and summed across these tracts for each facility. For non-carcinogens, EPA tabulated, for each facility, the number of people with a non-cancer risk ratio exceeding one.

- High-end individual. GAMS employs an algorithm to identify the location with the highest annual average concentration within the modeling boundary (i.e., within 50 km from the source). For ground-level, ambient-temperature sources such as the landfills modeled for this RIA, this distance tends to be on the order of 20 to 40 meters from the source[8], along the wind vector where the atmosphere is stable most frequently. EPA calculated the individual risk for a hypothetical receptor at this location for each facility.

[8]The reason it is not closer is that the receptor height is assumed to be 2 m above the ground.

EPA extrapolated the risks from the 35 (facility-specific results are presented for only 31 facilities because 4 of the facilities were determined to not be generating affected wastes in 1995) modeled facilities to the universe of 47 facilities managing TC nonwastewaters and soils. Uncertainty is introduced by this extrapolation; the risks at the 12 facilities that were not modeled may be higher or lower than risks at the facilities that were modeled.

Step 7. Simulate the regulatory alternatives. In this step, EPA reset the bulk concentrations in steps 1 through 3 with concentrations that would leach at the universal treatment standard concentrations. EPA then recalculated risks; the incremental risk reduction between the baseline and the post-regulatory scenario is the human health benefit, for the atmospheric pathway, for the regulation.

5.2.2 Results

Exhibits 5-11 and 5-12 provide results for the air pathway, for the baseline and post-regulatory scenario. In the baseline, 26 of the 35 modeled facilities (74 percent) have individu cancer risks exceeding 10^{-6} at the high-end individual location: 16 have risks between 10^{-6} and 10^{-4}, and 10 facilities have risks greater than 10^{-4}. The highest value is 5×10^{-3}.

For the high-end individual location, the non-cancer risk ratio exceeds one at only one facility.

The final regulation effectively reduces individual cancer risk. At the high-end individual location, eight facilities have risks exceeding 10^{-6}; the highest individual risk is 8×10^{-6}. Doses of all non-carcinogens are well below reference doses.

Exhibit 5-13 presents total population risks for cancer and non-cancer affects, and Exhibit 5-14 presents facility-specific cancer risks. As with the high-end individual, the regulation effectively reduces virtually all of the baseline population risk of cancer and non-cancer effects.

The Agency conducted some sensitivity analysis on emission rates, which directly affect estimated risks. Based on the work EPA did on the proposed and final rule RIAs, the Agency has determined that estimated risks are more sensitive to underlying estimates of volatilization release rates. The emission rate for volatilization far exceeds the rate for release via dust

EXHIBIT 5-11

Lifetime High-end Individual Cancer Risk via Air Inhalation Pathway

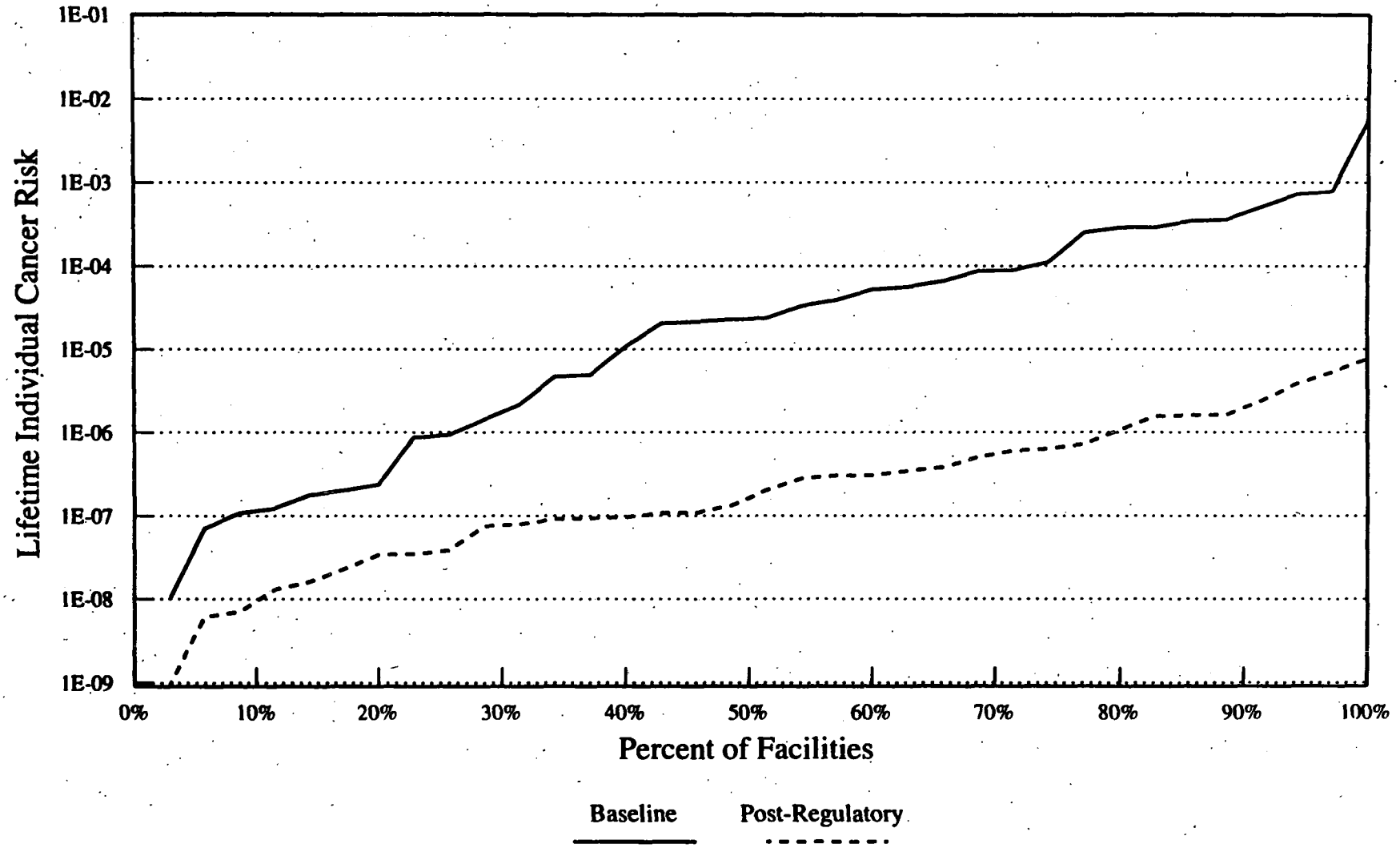


EXHIBIT 5-12

High-end Individual Non-Cancer Risk Ratio via Air Inhalation Pathway

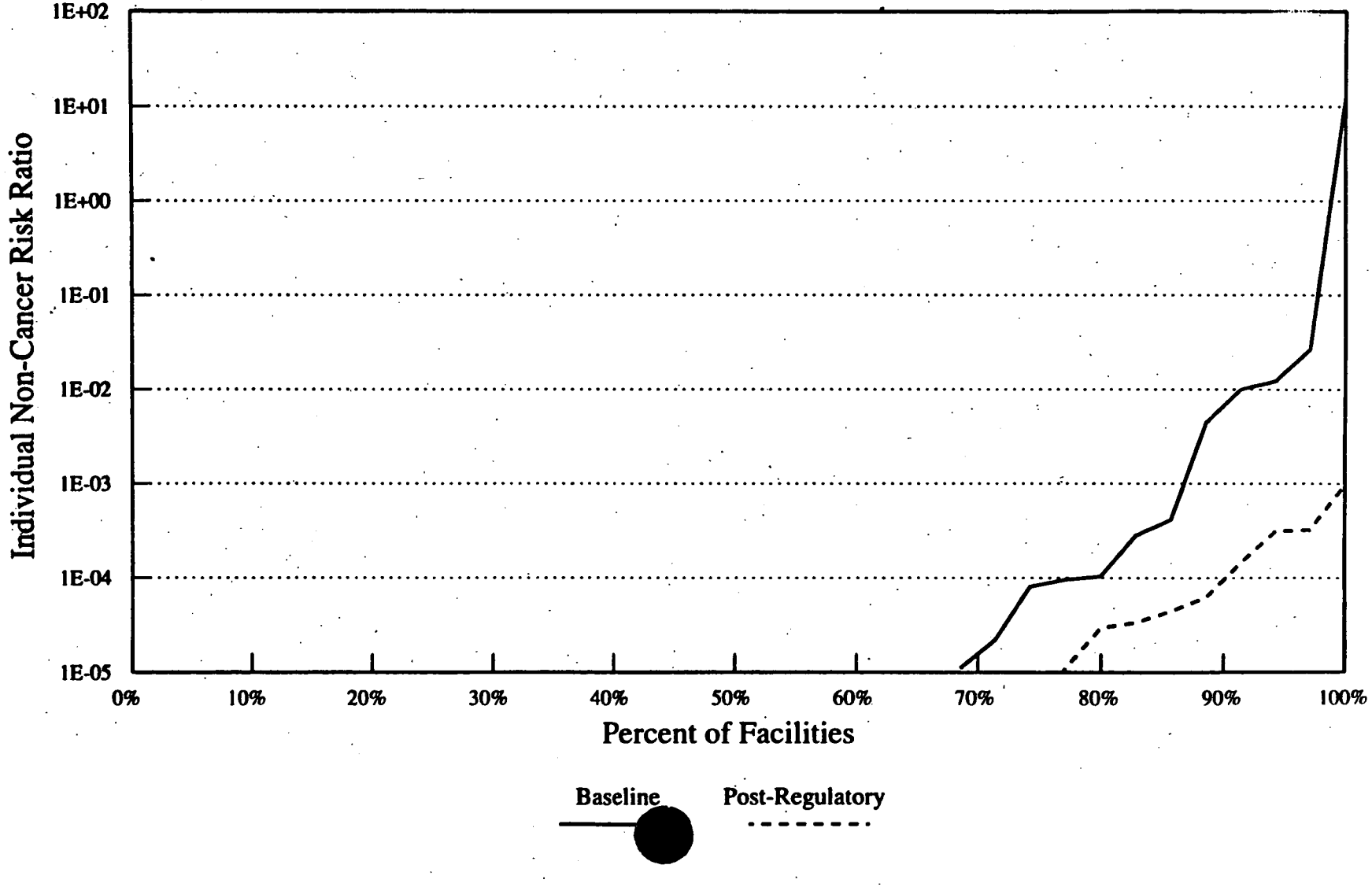


EXHIBIT 5-13

POPULATION RISK VIA AIR INHALATION PATHWAY

	Estimated Annual Cancer Cases	**Estimated Population Exposed Above Reference Dose**
Baseline Risk	3.7E-02	768
Post-regulatory Risk	1.8E-04	0
Risk Reduction: Baseline minus post-regulatory risk	3.6E-02	768

entrainment for almost all constituents in this analysis, and thus the sensitivity analysis focuses on volatile emissions.

Subtitle C permits usually require daily cover for land disposal units. The analysis assumed all units were uncovered, overstating the rate of volatilization. On the other hand, EPA also assumed that the waste is deposited in the landfill only one time per year, at the beginning of the year, rather than being replenished periodically. In the volatilization algorithm used in this analysis, the time-weighted average emission rate is inversely proportional to the square root of the duration of the averaging period. In other words, the shorter the time period of interest, the higher the emission rate for that period, all else being equal. The assumptions on cover and frequency of waste deposition interact in a complex way, and to some extent may offset each other.

Exhibit 5-15 shows the relationship between volatilization rate and (1) the frequency with which waste is placed and (2) the duration for which the waste is left uncovered. The first row shows the conditions used in the analysis (i.e., waste deposited once per year and left uncovered); subsequent rows show how emissions would vary under different assumptions on how frequently the waste is placed and how long waste is left uncovered. For purposes of calculating relative emission rates in this table, emissions while the waste is covered are assumed to be zero. Note that this sensitivity analysis assumed that the active area of the waste disposal unit does not

EHHIBIT 5–14

FACILITY-SPECIFIC CANCER AIR RISK RESULTS

No.	Baseline	Post-Regulatory
1	3.47E-02	1.27E-04
2	9.12E-02	3.70E-04
3	2.85E-01	1.77E-04
4	3.25E-02	2.68E-03
5	5.53E-02	1.50E-05
6	2.37E-01	1.10E-04
7	1.92E-02	1.26E-04
8	5.52E-05	3.02E-05
9	5.89E-04	1.36E-04
10	3.90E-03	8.38E-06
12	4.28E-05	5.00E-06
13	2.96E-02	1.34E-04
14	7.94E-04	5.71E-06
15	3.78E-04	1.23E-04
15	8.33E-01	3.63E-04
16	1.31E-03	8.06E-05
17	5.01E-02	3.40E-03
18	1.76E-06	1.65E-07
19	3.30E-02	1.91E-04
20	2.72E-03	5.32E-06
21	7.36E-05	2.38E-05
22	2.62E-04	1.32E-06
23	4.79E-05	2.77E-06
24	3.46E-02	3.46E-05
25	8.21E-02	4.47E-04
26	1.35E-03	1.82E-06
27	2.28E-03	2.84E-06
28	2.10E-03	5.93E-06
29	2.69E-02	1.70E-04
30	1.09E-04	2.11E-05
31	2.31E-02	5.23E-05
Annual Cancer Cases in Sample:	2.81E-02	1.50E-04
Annual Cancer Cases in Universe:	3.65E-02	1.82E-04

29-Jul-94

change, but that the depth of the waste does. In cases of very frequent waste disposal, this assumption becomes lass and less realistic, as the depth of waste would get thinner and thinner.

EXHIBIT 5-15

VOLATILIZATION RATES

Frequency of Waste Placement (times per year)	Duration Wastes are Uncovered (per placement)	Emission Rate Relative to Rate Used in the Analysis
1	1 year	1.0
250	8 hours	7.5
52	8 hours	1.6
33	8 hours	1.0
12	8 hours	0.36
4	8 hours	0.12
250	4 hours	5.3
52	4 hours	1.1
33	4 hours	0.71
12	4 hours	0.26
4	4 hours	0.09

In the TC Survey, EPA did not collect information on the frequency of waste deposition and the duration waste is uncovered. As the table shows, as the waste is placed more frequently and left uncovered for longer periods, the emission rate is higher and thus the baseline risks (and benefits of the rule) are higher. If waste is placed every operating day, and is left uncovered for 4 to 8 hours (or longer), then the baseline risks and benefits would be higher than those described earlier in this section. At a waste placement frequency of about once per week, if the wastes are uncovered for about 4 to 8 hours, the baseline risks are roughly the same as those described above. If the wastes are placed less frequently, (e.g., quarterly or monthly), then the baseline risks and benefits may have been overstated in the results described above.

In addition to the general analytic limitations described in section 5.4.2, one caveat is particularly important for the sensitivity analysis on volatile emissions. The algorithm used to estimate emissions is based on an assumption that there is an infinite depth of contaminated soil which acts as the source of volatilization. Holding the area of the waste management unit and the volume of waste annually deposited in the unit constant, as the frequency of waste deposition

increases, the layer of contaminated waste becomes thinner and thinner, and the infinite depth assumption becomes less and less valid. As a result, applying the algorithm to the scenarios with frequent waste deposition (e.g., 250 times per year) is a less valid application than those for less frequent waste deposition, and the estimated emission rates for the high-frequency scenarios may overstate emissions.

5.3 EFFECT OF LDRS ON PROPERTY VALUES

This section discusses another potential benefit of treating toxicity characteristic (TC) nonwastewaters. Treating these wastes may allow them to be disposed of in Subtitle D (non-hazardous) waste facilities rather than in Subtitle C (hazardous) waste facilities, and may reduce the total number of hazardous waste sites required. Both kinds of waste sites are disamenities; they impose costs on the surrounding residents, including health risks and nuisance effects like noise, odor, and traffic. However, since hazardous waste sites are perceived by the public as riskier than non-hazardous sites, the costs they impose are higher. Replacing hazardous waste sites with non-hazardous waste sites would then produce a benefit for residents near these sites.

EPA has conducted a preliminary analysis of these potential benefits, described in this section. The costs imposed by waste sites have been estimated in numerous studies through their effect on surrounding residential property values. Property values reflect the effects of surrounding amenities and disamenities and can be used to estimate the values of these effects to residents. EPA has based its analysis of the potential property value benefits of TC waste treatment on a review of these studies.

5.3.1 Methodology

The studies EPA reviewed use hedonic analysis to estimate the effect of waste sites on property value. The premise of hedonic property value analysis is that housing prices are determined by a range of attributes of the house, its site, and its neighborhood. The technique uses multiple regression analysis to determine the separate effects of each factor on housing price. If one attribute included in the analysis is an environmental characteristic, the effect of that characteristic on price can be used to estimate the benefits from changes in the level of that characteristic (e.g. a change in the level of air pollution or in the distance to a waste site).

One of the attributes captured in a hedonics study is how the level of potential personal health risk affects housing prices. In capturing health risk as an attribute that affects housing prices, the study *double-counts* potential benefits quantified for health risk from the ground-water and air pathways. Therefore, the study presented in the RIA is a *supplemental* benefits analysis, not meant to be added to other benefits quantified for the Phase II rule.

Many analyses exist on the effect of waste sites on property value. Some have studied hazardous waste sites and some non-hazardous waste sites. However EPA is aware of only one study, by Thayer et al.,[9] that explicitly compares the effects of these two kinds of sites. EPA has therefore based its analysis on this study. Thayer et al. use the hedonic method to determine the effect of distance from hazardous and non-hazardous waste sites on housing purchase prices. They use a data set from Baltimore, Maryland, containing 2,323 observations of housing transactions. Data on waste facilities are from EPA records of treatment, storage and disposal facilities. The authors first estimate the effect of all waste sites on housing value, measured in dollars per mile. They then use dummy variables to distinguish the effects of hazardous and non-hazardous waste sites.

The basic results of the Thayer study are comparable to those of other studies. As distance from any waste site (hazardous or non-hazardous) increases, housing value increases, all other factors held constant. Thayer et al. estimate an increase of $1,300 to $1,700 per mile (depending on the functional form of the regression equation). Other hedonic property value studies that EPA reviewed showed estimates in the range of $2,000 to $5,000 per mile for hazardous and non-hazardous waste sites. Given the inherent variation in the results of hedonic property value studies, Thayer et al.'s findings are similar to those of other authors. The fact that they are somewhat lower than the other studies surveyed suggests that EPA's use of the Thayer study may yield conservative estimates of the property value benefits of hazardous waste treatment.

EPA defined a specific scenario to evaluate the potential benefits of treating TC nonwastewaters. Using information from the TC Survey, EPA identified 47 facilities expected to generate TC nonwastewaters, soil and debris in 1995. EPA eliminated the 17 commercial facilities

[9] Thayer, Mark, Heidi Albers, and Morteza Rahmatian, "The Benefits of Reducing Exposure to Waste Disposal Sites: A Hedonic Housing Value Approach," unpublished paper.

(including CBI facilities) from this group, assuming that commercial facilities would continue to manage a variety of wastes, including hazardous wastes. The remaining 30 facilities were industrial sites, likely to be managing fewer wastestreams on site. For the purpose of estimation, EPA assumed that each of these 30 Subtitle C sites would be replaced with or convert to a Subtitle D facility. In effect, this approach assumes that the Thayer et al. study's hazardous waste facilities can be equated with Subtitle C land disposal facilities.

The results of the Thayer study suggest that, for each owner-occupied house within a one-mile radius of a facility, replacing the Subtitle C site with a Subtitle D site would result in a benefit of $517 dollars. The mean value of houses in the study sample was $105,600, so this benefit is equivalent to 0.49 percent of the value of each house. Using U.S. Census Bureau data,[10] EPA estimated the value and density (i.e., houses per square mile) of owner-occupied houses in the region in which each site is located. From these data, EPA calculated the expected number of houses within one mile of each site, the expected benefit per household for each site, and total benefits for each site. For example, one facility in the TC Survey is located in Port Arthur, Texas. EPA estimates that the average density of houses in EPA's Region VI is 425 u per square mile, or 1,335 houses within a circle with a one-mile radius. An estimate of the average value of a house in Region VI is $72,000; 0.49 percent of this value (the expected benefit per household) is $350. Thus, the total estimated benefit for this facility is about $470,000. The sum of benefits across all 30 sites produced an estimate of the total property value benefit of treating the TC wastes.

5.3.2 Results

Exhibit 5-16 shows the results of this preliminary analysis. EPA estimates benefits per house of TC waste treatment ranging from $320 to $450 for houses near the 27 facilities, and benefits per facility ranging from $470,000 to $1.1 million. The total benefits, summed across facilities, are estimated to be about $20 million (1993 dollars).

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[10] U.S. Department of Commerce, U.S. Department of Housing and Urban Development, American Housing Survey, for numbers of owner-occupied houses in U.S. cities (data from 1987 through 1990 used); U.S. Department of Commerce, County and City Data Book: 1983, for land area of corresponding cities. Dollars converted from year of survey dollars to 1993 dollars using the housing price index reported in U.S. Department of Commerce, Bureau of Economic Analysis, Survey of Current Business.

EXHIBIT 5-16
ANALYSIS OF PROPERTY VALUE
EFFECTS OF TC WASTE TREATMENT

Measure	Value
House Density (Houses per Square Mile)	430 - 1,100
House Value ($)	64,000 - 92,000
Benefit Per House ($)	320 - 450
Benefit Per Facility ($ million)	0.47 - 1.1
TOTAL BENEFITS ($ million)	20

5.4 LIMITATIONS OF THE ANALYSIS

This analysis is subject to many limitations, some of which tend to understate benefits, others to overstate benefits, and some introducing uncertainty, but having no clear bias either way. Below, EPA lists some of the principal limitations of the analysis, and notes the likely direction of bias where it is known.

5.4.1 Ground Water Risk Analysis

Factors that overstate benefits:

- The DAF distribution used to estimate baseline risks was determined by beginning with the Subtitle D DAF distribution derived for the TC rule and adjusting it to represent a Subtitle C landfill with some degree of failure. The failure assumptions used simplify an extremely complex set of phenomena and have the effect of applying a scaling factor to the DAFs. EPA considers it likely that the assumptions tend to underestimate the true effectiveness of Subtitle C containment. This assumption tended to overestimate the baseline risks, while the

post-regulatory risks were not affected. Thus the total ground-water benefits were probably overstated.

- The infinite source and steady-state assumptions used to develop the original DAFs for the TC rule are conservative. In reality, there may not be sufficient mass of constituent to act as an infinite source of contaminant. (A related point is that although the Agency did provide a mass balance check within the air risk pathway, it did not design the analysis to produce an inter-media mass balance check, i.e., it did not constrain mass so that the sum of air emissions and leachate releases must be less than the total mass of constituents disposed). Moreover, it may take centuries or millennia to attain equilibrium concentrations in a ground-water system, so the baseline risks may not occur until some point in the very distant future.

- The approach does not account for ground-water monitoring and corrective action in the baseline. Existing regulations require that hazardous waste land disposal units conduct monitoring during the operating, closure, and post-closure periods. If containment systems fail while the monitoring is underway, and contamination is detected in ground water, this would trigger corrective action. The corrective action program would reduce risks, thus reducing the baseline risk level. Thus, the benefits of the LDRs are overstated to the extent that the baseline risks are reduced by corrective action.

- The approach does not take into account the effect of taste or odor thresholds, or water supply monitoring, which can alert receptors to the presence of contaminants and can lead to a halt in exposures. Therefore, the approach calculates risks for cases where exposure is unlikely to occur (i.e., the contaminant would be detectable by routine public water supply monitoring, and so the water would not be consumed). This effect will be more significant in the baseline case because the concentrations are higher. Therefore, the baseline risks may tend to

be overestimated and the approach may tend to overestimate the benefits of the rule.

- Approximately 72 percent of the estimated ground-water population cancer risk comes from a wastestream that is approximately 95 percent PCBs. As PCB isomers have a high soil-water partition coefficient, and thus cannot be expected to migrate any appreciable distance in ground water, the use of a generic DAF (i.e., not a constituent-specific DAF) would result in an over-estimation of the benefits for this wastestream, and thus for the rule. However, the Agency does have reason to believe that PCBs migrate in soil when they are in the presence of solvents, and the remaining five percent of this particular wastestream does contain solvents.

- The central tendency estimate for the groundwater pathway has been overstated by employing an assumption of two liters per day rather than using 1.4 liters per day.

- The DAF distribution used in the RIA was not mathematically corrected to extend from the one mile distance used in the TC analysis to the two miles used for this analysis. Therefore, EPA performed a sensitivity analysis reanalyzing the ground-water risk, considering only wells within a one-mile radius. The alterations and results of this analysis are provided in Appendix K of the RIA. In summary, the revision changed the central tendency cancer cases per year from 0.22 to 0.18, and changed the non-cancer exposed population from 2,038 to 1,136.

Factors that understate benefits:

- One assumption in estimating the post-regulatory risks was that the leachate concentration could be represented by the universal standard for each constituent. Because the universal standard represents a *maximum* allowable concentration in the post-regulatory case, it is possible that safety factors in the treatment process

or treatment of other constituents may reduce constituent concentrations to below the universal standards for some constituents. In these cases, our approach will underestimate the benefits of the rule.

- The TC capacity database did not provide comprehensive data for each of the regulated facilities. Because EPA's approach focused on the highest-risk constituent for each facility, additional information on relatively low-level constituents would not be significant. However, the exclusion of high-concentration or more toxic constituents would tend to underestimate baseline risks and thus underestimate benefits.

Factors with an indeterminate effect on benefits:

- Leachate concentrations in the environment are assumed to be equal to TCLP concentrations reported in the TC survey. It is not clear how closely the TCLP simulates actual long-term leaching behavior.

- The EPACML model used to calculate the DAF distribution assumes steady-state ground-water flow in a homogeneous, isotropic medium. Because exposures to contaminated ground water may be time sensitive, and because actual hydrogeologic conditions are often complex, this approach is limited in its ability to account for these factors. The steady-state assumption tends to overstate actual exposure concentrations; the direction of bias associated with assuming homogeneous, isotropic media is not known.

- The DAF distribution used in this analysis was calculated by examining the environmental and exposure parameters associated with Subtitle D landfills. While the DAF was adjusted to account for the increased effectiveness of a Subtitle C landfill to limit leachate flow, the distribution was still fundamentally based on Subtitle D data. Differences in location and surrounding land use between

Subtitle D and Subtitle C landfills may result in differences to the DAF distribution. The direction and magnitude of the effects of these differences is uncertain.

5.4.2 Air Risk Analysis

Factors that overstate benefits:

- This analysis assumed that all constituent mass was available for volatilization. In reality, only a portion of the mass would volatilize because some would leach into ground water or be transported by surface runoff.

- EPA did not estimate the air emissions and risks attributable to the treatment of waste in the post-regulatory alternatives.

- EPA assumed that indoor air concentration are equal to outdoor concentrations. In some situations, indoor air concentrations are not equal to outdoor air concentrations. This can occur when (1) there is an indoor source of pollutant in which case concentrations are higher indoors, (2) the pollutant is extremely reactive (e.g., ozone) and degrades rapidly indoors, and (3) the pollutant is from an outdoor source, and is associated with particulates. In the latter case, concentrations are often lower indoors than outdoors. Most of the emissions of concern for the Phase II LDR RIA are volatile emissions. None of the constituents is extremely reactive, and the source is not indoors. Thus, it is reasonable to assume that indoor air concentrations are equal to outdoor air concentrations. Nevertheless, this assumption may slightly overstate baseline risks and benefits.

- EPA assumed continuous exposures over a seventy-year period. Over the course of the period, many people would spend much of their time away from home, and

many others would move to a different location. Thus, this assumption would overstate baseline risk (and risk reduction benefits) for these people.

- One of the facilities modeled to estimate air benefits includes a large wastestream generated from the clean-out of a surface impoundment. Because this stream is not expected to be generated in 1995, benefits associated with emissions from the stream will tend to overestimate the benefits of the rule.

Factors that understate benefits:

- The analysis assumes one wastestream per facility. To compute constituent concentrations for this one wastestream, EPA averaged the concentrations of each constituent across all TC wastestreams at the facility. This generally decreased the concentration of a given constituent, often below TC regulatory levels, because concentrations were averaged across even those wastestreams that do not contain the constituent.

Factors with an indeterminate effect on benefits:

- The population risks were linearly extrapolated from the 35 facilities modelled to the 47 facilities known to exist in the universe. Risks at the 12 facilities not modelled might be over- or understated, depending on how well the sample represents their waste volumes, constituent concentrations, and other factors.

- Approximately one-half of the TC wastes are sludges or debris, and these materials will volatilize organics differently than soil. However, EPA simulated air emissions by modeling all waste material as soil. For some sludges this is a reasonable assumption, while for other sludges and debris the assumption is less valid.

- The volatilization model assumes an infinite depth of contamination. Although the mass balance check in the analysis prevents more mass from volatilizing than is present in the unit, the limitations inherent to the volatilization model apply to the analysis.

- Unit area was assumed to equal the annual volume of waste managed divided by a depth of four meters. Unit areas are therefore likely to have been over- and underestimated. The area is a key variable in the analysis, especially for the dust entrainment computation.

- EPA simulated air risks by assuming facility-specific population distributions and by assuming on-site landfill disposal. However, the Agency determined that approximately 47 percent of the TC nonwastewaters were being managed in surface impoundments according to the 1992 TC survey. Because most of these impoundments are expected to close, these wastes are likely to be send to off-site locations for landfill disposal. The Agency, therefore, examined the benefit results for the air pathway for 95 percent of the volume that was assigned to surface impoundment management by the TC Survey. This volume was responsible for approximately 4 percent of the incremental benefits for the air pathway. Therefore, given available data, EPA believes that the uncertainty with regard to disposal location has no practical effect on the air benefits pathway results.

- The Agency 11 modeled land treatment units as landfills to calculate air emissions. This may either under- or over-state the risks from these facilities.

5.4.3 Property Value Analysis

As discussed in section 5.3, this is a preliminary analysis and EPA presents it to illustrate the scale of potential property value benefits from TC waste treatment, rather than to measure these benefits precisely. The analysis has the following specific limitations:

Factors that overstate benefits:

- A major assumption in the analysis is that it assumes that the effect of the LDRs for TC wastes can be represented as a conversion of Subtitle C to Subtitle D sites.

- Estimates of the numbers of houses near facilities were based on estimates of house density in metropolitan areas. For sites in small towns or rural areas, these estimates may overstate the actual numbers of houses affected.

Factors that understate benefits:

- The distance beyond which waste sites have no significant effect on housing prices is uncertain. This analysis assumes no effect occurs beyond one mile from sites; other assumptions could significantly increase estimates of benefits.

Factors with an indeterminate effect on benefits:

- The analysis is based on one study using data from one city, Baltimore, Maryland.

- The hedonic method itself produces uncertain results. Though it is widely used and accepted, practitioners recognize that its results may vary significantly

depending on the data and analytical methods used, residents' perceptions of environmental effects, and other factors.[11]

- Housing density and value data were not available for each town or city where facilities were located. Instead, EPA used data for major cities reported in the American Housing Survey since 1987, and averaged these data for this analysis.

[11]See for example Pearce, David W. and Anil Markandya, Environmental Policy Benefits: Monetary Valuation, Paris: Organization for Economic Cooperation and Development, 1989.

APPENDIX A

TC SURVEY QUESTIONNAIRE

QUESTIONNAIRE FOR FACILITIES THAT LAND DISPOSE NEWLY-IDENTIFIED ORGANIC WASTES EXHIBITING THE TOXICITY CHARACTERISTIC

INTRODUCTION

Purpose of the Survey

The U.S. Environmental Protection Agency's Office of Solid Waste (OSW) is currently developing regulations that will restrict the land disposal of certain wastes exhibiting the Toxicity Characteristic (TC) (i.e., newly-identified organic TC wastes: RCRA codes D018 through D043). In preparation for the land disposal restrictions (LDRs) of these wastes, OSW is conducting a capacity analysis to identify 1) the volume of newly-identified organic TC wastes that will require treatment as a result of the LDRs, and 2) the availability of treatment/recovery systems to manage newly-identified organic TC wastes to meet treatment standards. The results of this analysis will be used to support EPA's determination on whether to grant a national capacity variance from the statutory date of the LDRs for newly-identified organic TC wastes.[1]

To estimate the quantity of newly-identified organic TC wastes that are currently land disposed and, therefore, may require treatment upon promulgation of the LDRs, OSW is conducting a focused data collection effort. This effort consists of a questionnaire for facilities with land disposal units that are permitted or have interim status to land dispose the newly-identified organic TC wastes. [NOTE: LAND DISPOSAL UNITS REFER TO UNITS USED TO TREAT, STORE, OR DISPOSE HAZARDOUS WASTES IN OR ON THE LAND. LAND DISPOSAL UNITS INCLUDE LANDFILLS, SURFACE IMPOUNDMENTS, LAND TREATMENT UNITS, WASTE PILES, AND UNDERGROUND INJECTION WELLS.] Under Section 3007 of the Resource Conservation and Recovery Act (RCRA), 42 USC 6927, you are required to provide EPA with the information requested in this questionnaire.

The purpose of this data collection effort is to determine 1) the volumes of newly-identified organic TC wastes that will require treatment as a result of the LDRs, and 2) the availability of on-site treatment and recovery systems to manage newly-identified organic TC wastes. (EPA is undertaking a separate effort to evaluate the commercial availability of treatment and recovery systems to manage newly-identified organic TC wastes.)

How We Plan to Collect this Information

We have prepared this questionnaire as a guide for data collection. The questions in each section of the questionnaire suggest a format to present the answers. We expect respondents to provide the data in the most convenient means available. Examples of alternative ways to answer the questionnaire include sending computer printouts or copies of internal records and downloading electronic data.

We are providing contractor support to assist facilities in responding to the questionnaire and we plan to work closely with you. Prakash Ramaswamy of ICF Incorporated has already contacted your facility and will serve as your primary contact. After you have read through the questionnaire, but before you begin to assemble the information, we encourage you to contact Prakash Ramaswamy at (703) 934-3426. Also, please feel free to call Bengie Carroll or Pan Lee, U.S. EPA, Capacity Programs Branch at (703) 308-8440.

Who Should Respond

Only facilities that have managed the newly-identified organic TC wastes in land disposal

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[1]The LDRs are effective when promulgated unless the Administrator grants a national capacity variance from the otherwise applicable date and establishes a different date (not to exceed two years beyond the statutory deadline) based on...the earliest date on which adequate alternative treatment, recovery, or disposal capacity which protects human health and the environment will be available (RCRA Section 3004(h)(2)). Case-by-case extensions of the variance may also be granted to facilities demonstrating that there is a binding contractual commitment to construct or otherwise provide alternative capacity but due to circumstances beyond the applicant's control, alternative capacity cannot reasonably be made available by the effective date (RCRA Section 3004(h)(3)).

units in 1991, including TC-contaminated soil and debris, should complete this questionnaire. Newly-identified organic TC wastes are defined as those wastes that have an EPA hazardous waste code of D018 through D043 in 40 CFR 261.24. Each waste code corresponds to an organic constituent determined by the Toxicity Characteristic Leaching Procedure (TCLP) to exceed the promulgated regulatory level. The codes and corresponding constituents are listed in Appendix A.

Facilities that do not land dispose newly-identified organic TC wastes (i.e., do not dispose, store, or treat newly-identified organic TC wastes in landfills, surface impoundments, land treatment units, waste piles, or underground injection wells) only need to complete Section I of this questionnaire.

When to Return this Questionnaire

Please plan to complete the questionnaire within three weeks of receipt and mail it back in the enclosed postage-paid envelope.

Where to Return this Questionnaire

In the event that the enclosed envelope is misplaced, the address you should return the questionnaire to is:

ICF Incorporated, Room 815
9300 Lee Highway
Fairfax, Virginia 22031-1207
Fax: (703) 934-9740
Attn: Prakash Ramaswamy

Organization of the Questionnaire

This questionnaire is organized into five sections and four appendices:

Section I — General Facility Information: General information on your facility;

Section II — Land Disposal Units: Information on existing land disposal units used in 1991 to manage newly-identified organic TC wastes;

Section III — Newly-Identified Organic TC Waste Streams Managed in Land Disposal Units: Information on wastes exhibiting a newly-identified organic TC that are managed in on-site land disposal units;

Section IV — Treatment or Recovery Systems For Managing Newly-Identified Organic TC Wastes: Information on treatment or recovery systems that are used or could be used to manage newly-identified organic TC wastes, including soil and debris;

Section V — Additional Information: Information on future changes in the generation and management of newly-identified organic TC wastes;

Appendix A — Newly-Identified Organic TC Hazardous Waste Codes and Their Constituents;

Appendix B — Potential Organic TC Treatment or Recovery Systems;

Appendix C — Debris Types; and

Appendix D — Sample Block Diagrams.

Confidentiality

The information that you provide in this questionnaire will be handled in accordance with RCRA Section 3007(b), 40 CFR Part 2, and 40 CFR Part 260.2 which establish EPA's general policy regarding public disclosure of information. Information may be submitted as Confidential Business Information (CBI) in accordance with 40 CFR Part 2.203(b). Information covered by a claim of CBI will be treated in accordance with the procedures set forth in 40 CFR Part 2, Subpart B. However, information not covered by a CBI claim may be made available to the public without prior notice to the business.

If you wish to submit information as CBI, please send your response to at the following address:

U.S. Environmental Protection Agency
401 M Street, S.W., Mail Code OS-312
Washington, D.C. 20460
Attn.: Margaret Lee, Room SE-264

Thank you for your help.

Form Approved
OMB No. 2050-0119
Expires 12/31/92
ID# 0121

U.S. ENVIRONMENTAL PROTECTION AGENCY

QUESTIONNAIRE FOR FACILITIES THAT LAND DISPOSE NEWLY-IDENTIFIED ORGANIC TC WASTES

Section I. GENERAL FACILITY INFORMATION

1. Facility Name _____

2. Facility EPA ID Number _____

3. Facility Mailing Address _____
   City, town, etc. _____
   State _____
   Zip Code _____
   County _____

4. Facility Location (if different) _____
   City, town, etc. _____
   State _____
   Zip Code _____
   County _____

5. Person to contact regarding responses to this questionnaire
   Name _____
   Title _____
   Phone _____

6. During 1991, did the facility place any newly-identified organic TC wastes (i.e., wastes having the EPA hazardous waste codes of D018 through D043) in a land disposal unit?[1]

   ☐ Yes: *Go to question 7.*

   ☐ No: *Return the questionnaire. Thank you for your cooperation.*

[1]Land disposal units refer to units used to treat, store, or dispose of hazardous wastes in or on the land. Land disposal units include landfills, surface impoundments, land treatment units, waste piles, and underground injection wells.

Section I. GENERAL FACILITY INFORMATION (continued)

7. Provide simple block diagrams (i.e., schematics) of relevant systems relating to the generation and/or management of wastes exhibiting an organic toxicity characteristic (TC). Indicate any operations or processes that involve newly-identified organic TC wastes (e.g., generation, handling, treatment, and disposal). The block diagrams are a tool to organize data collection and allow us to understand, at a glance, your facility's operations. (*Please refer to Appendix D for sample block diagrams.*)

Section II. LAND DISPOSAL UNITS

This section requests information on the land disposal units at your facility. For the capacity analysis, we compare the total volume of wastes that are placed in or on the land prior to the effective date of the standard with the total national capacity capable of meeting the LDR treatment standards. The data you provide will be used to determine the volumes of wastes that are placed in or on the land. We will use your responses on specific units to determine whether the volumes managed in the units will be included in the demand for needed treatment as a result of the LDRs. For example, volumes of wastes disposed in units with approved no-migration petitions can continue to be managed in the land disposal unit and will not require treatment as a result of the LDRs. Whereas, the volumes of TC wastes disposed untreated in landfills will require treatment.

Copy and complete the relevant part of Section II for each land disposal unit that was used in 1991 to manage organic TC wastes: A) Landfills; B) Land Treatment Units; C) Surface Impoundments; D) Waste Piles; and E) Underground Injection Wells. Assign a unique number to each unit and indicate the number on each page. ***Please note that throughout this section, the term TC wastes refers to the newly-identified organic TC wastes.***

8. Type of land disposal units at your facility used to manage wastes exhibiting the newly-identified organic TC: (*Check all that apply and complete the relevant sections*)

☐ Landfill (*Complete Section A for each landfill*)

☐ Land Treatment Unit (*Complete Section B for each land treatment unit*)

☐ Surface Impoundment (*Complete Section C for each surface impoundment*)

☐ Waste Pile (*Complete Section D for each waste pile*)

☐ Underground Injection Well (*Complete Section E for each underground injection well*)

Section II. LAND DISPOSAL UNITS (continued)

A. Landfills

Landfill Unit No.____

Answer the following questions for each active hazardous waste landfill at the site that received newly-identified organic TC wastes during 1991.

9. Commercial status of the landfill: (*Check all that apply*)

- ☐ The landfill is only available for management of hazardous waste generated on site.
- ☐ The landfill is available only to firms owned by the same company.
- ☐ The landfill is available to a limited group of establishments for commercial hazardous waste management.
- ☐ The landfill is available to any firm or establishment for commercial hazardous waste management.

10.a) Total quantity of hazardous wastes disposed in 1991:
Quantity: _____ tons gallons (*circle one*)

b) Permitted capacity remaining after December 31, 1991:
Quantity: _____ tons gallons (*circle one*)

Section II. LAND DISPOSAL UNITS (continued)

B. Land Treatment Units

Land Treatment Unit No.____

Answer the following questions for each land treatment unit at the site that received newly-identified organic TC wastes during 1991.

11. Commercial status of the land treatment unit: (*Check all that apply*)

☐ The land treatment unit is only available for management of hazardous waste generated on site.

☐ The land treatment unit is available only to firms owned by the same company.

☐ The land treatment unit is available to a limited group of establishments for commercial hazardous waste management.

☐ The land treatment unit is available to any firm or establishment for commercial hazardous waste management.

12. No-migration petition status for this unit: (*Specify one of the following categories*)

☐ A no-migration petition has not been submitted for this unit, and there are no plans to do so.

☐ Date no-migration petition was submitted:_____

a) What is the status of the petition? (*Check one*)
____ Approved.
____ Rejected or withdrawn.
____ Pending.

b) Does the approved or pending no-migration petition allow for management of TC wastes in this unit?
____ Yes.
____ No.

☐ Facility intends to submit a no-migration petition for this unit, but has not done so at the present time.

a) Expected submission date of the petition:_____

b) Does the approved or pending no-migration petition allow for management of TC wastes in this unit?
____ Yes.
____ No.

Section II. LAND DISPOSAL UNITS (continued)

C. Surface Impoundments

Surface Impoundment No.____

Answer the following questions for each surface impoundment at the site that received newly-identified organic TC wastes during 1991.

13. Type of surface impoundment: (*Check all that apply*)

☐ Storage

☐ Treatment (*specify the type of treatment using Appendix B codes or by describing system*):

_____

_____

☐ Disposal

14. Commercial status of the surface impoundment: (*Check all that apply*)

☐ The surface impoundment is only available for management of hazardous waste generated on site.

☐ The surface impoundment is available only to firms owned by the same company.

☐ The surface impoundment is available to a limited group of establishments for commercial hazardous waste management.

☐ The surface impoundment is available to any firm or establishment for commercial hazardous waste management.

Section II. LAND DISPOSAL UNITS (continued)

C. Surface Impoundments (continued)

Surface Impoundment No.____

15. Status of surface impoundment with respect to minimum technological requirements: (*Check all that apply*)

☐ Meets minimum technological requirements. (*Proceed to next land disposal unit*)

☐ Retrofitted to meet minimum technological requirements on _____ (*provide date*). (*Proceed to next land disposal unit*)

☐ Will be retrofitted to meet minimum technological requirements.
Date when retrofitting will be completed: _____ (*Proceed to next land disposal unit*)

☐ Has applied for a waiver from retrofitting. What is the status of the application?
__ Pending
__ Rejected
(*Proceed to next land disposal unit*)

☐ Has received a waiver from retrofitting. Provide basis for waiver: _____
_____
(*Proceed to next land disposal unit*)

☐ Plan to close prior to effective date of minimum technological requirements (i.e., March 25, 1994). (*Proceed to next land disposal unit*)

☐ Was closed by end of 1991.
What was the date of closure?_____
(*Continue to question 16*)

☐ Will be closed by 1995.
What is the expected date of closure?_____
(*Continue to question 16*)

☐ Will be closed after 1995.
What is the expected date of closure?_____
(*Continue to question 16*)

Section II. LAND DISPOSAL UNITS (continued)

C. Surface Impoundments (continued)

Surface Impoundment No.____

16. Complete this question only if the surface impoundment was closed by end of 1991 or will be closed by 1995. (*Check the appropriate closure activities for the unit. Use your best judgement or existing plans as a basis.*)

☐ Tanks will be installed to replace the unit.
Estimated annual volume of waste to be removed during tank clean-outs _____ Units: _____ (*Proceed to next option*)

☐ Unit was or will be closed with wastes in place. (*Proceed to next land disposal unit*)

☐ Waste was or will be removed from the unit as part of closure. (*Continue to question 17*)

☐ A partial removal of wastes was or will be conducted with some wastes remaining in the unit. (*Continue to question 17*)

17. Expected volume of waste to be removed from unit:[1] (*Use your best judgement*)

	1992	1993	1994	1995	Units
Wastewaters[2]					
Nonwastewaters[2]					
RCRA contaminated soil					
RCRA contaminated debris					

Types of contaminated debris (use Appendix C codes):

_____

[1]These wastes could be affected by the LDRs if the wastes are removed from the unit following the effective date of the LDR prohibition.

[2]Wastewaters contain less than 1 percent total organic carbon and less than 1 percent total suspended solids. Nonwastewaters include all liquids that do not meet the wastewater definition as well as all sludges and solids other than soil or debris.

Section II. LAND DISPOSAL UNITS (continued)

D. Waste Piles

Waste Pile No.____

Answer the following questions for each waste pile unit at the site that received newly-identified organic TC wastes during 1991.

18. Type of waste pile:

☐ Storage

☐ Treatment (*specify by using Appendix B codes or written description*) _____

_____

19. Commercial status of the waste pile: (*Check all that apply*)

☐ The waste pile is only available for management of hazardous waste generated on site.

☐ The waste pile is available only to firms owned by the same company.

☐ The waste pile is available to a limited group of establishments for commercial hazardous waste management.

☐ The waste pile is available to any firm or establishment for commercial hazardous waste management.

20. No-migration petition status for this unit: (*Specify one of the following categories*)

☐ A no-migration petition has not been submitted for this unit, and there are no plans to do so.

☐ Date no-migration petition was submitted:_____.

a) Status of the petition: (*Check one*)
____ Approved.
____ Rejected or withdrawn.
____ Pending.

b) Does the approved or pending no-migration petition allow for management of TC wastes in this unit?
____ Yes.
____ No.

☐ Facility intends to submit a no-migration petition for this unit, but has not done so at the present time.

a) Expected submission date of the petition:_____

b) Does the approved or pending no-migration petition allow for management of TC wastes in this unit?
____ Yes.
____ No.

Section II. LAND DISPOSAL UNITS (continued)

E. Underground Injection Wells

Underground Injection Well No.____

Answer the following questions for each underground injection well at the site that received newly-identified organic TC wastes during 1991:

21. Commercial status of the well: (*Check all that apply*)

☐ The well is only available for management of hazardous waste generated on site.

☐ The well is available only to firms owned by the same company.

☐ The well is available to a limited group of establishments for commercial hazardous waste management.

☐ The well is available to any firm or establishment for commercial hazardous waste management.

22. No-migration petition status for this unit: (*Specify one of the following categories*)

☐ A no-migration petition has not been submitted for this unit, and there are no plans to do so.

☐ Date no-migration petition was submitted:_____

a) Status of the petition: (*Check one*)
____ Approved.
____ Rejected or withdrawn.
____ Pending.

b) Does the approved or pending no-migration petition allow for management of TC wastes in this unit?
____ Yes.
____ No.

☐ Facility intends to submit a no-migration petition for this unit, but has not done so at the present time.

a) Expected submission date of the petition:_____

b) Does the approved or pending no-migration petition allow for management of TC wastes in this unit?
____ Yes.
____ No.

Section III. NEWLY-IDENTIFIED ORGANIC TC WASTE STREAMS MANAGED IN LAND DISPOSAL UNITS (LANDFILLS, LAND TREATMENT UNITS, SURFACE IMPOUNDMENTS, WASTE PILES, AND UNDERGROUND INJECTION WELLS)

This section requests information on the waste streams managed in your facility's land disposal units. We will use this information and the proposed LDR treatment standards for TC wastes to assign each waste stream to an appropriate treatment train such that the waste will meet the proposed treatment standards. Although we use facility specific information to estimate the national demand for treatment as a result of the LDRs, this assignment is for analytical purposes only. We are not making any a priori judgements on how your facility will actually respond to the LDRs.

Copy and complete Section III for each waste stream managed on site that exhibits a newly-identified organic TC, including residuals generated as a result of on-site treatment and TC-contaminated soil and debris.[1] *This section is to be completed for each waste stream managed at your facility, including wastes received from off site and one-time wastes produced from on-site closures of units. Do not report waste streams that are shipped off site. All responses are to reflect management in the 1991 calendar year. Assign a unique number to each waste stream and indicate the number. If applicable, indicate the EPA ID number of the off-site generator from whom you received the waste.*

A. Waste Description

Waste Stream No._____
EPA ID No. of Off-site Generator (If applicable)_____

23. Indicate waste origin.

☐ Generated and managed on site. (*Go to question 25*)

☐ Received from off site. (*Continue to question 24*)

24. Indicate the forms in which you receive waste stream. *(Check all that apply)*

☐ Roll-off bin ☐ Rigid tote

☐ Rail car ☐ Carboy

☐ Tanker trucks ☐ Pallet

☐ Steel drum, specify sizes _____

☐ Poly drum, specify sizes _____

☐ Fiber drum, specify sizes _____

☐ Bag or other flexible container, specify sizes _____

☐ Other, specify _____

[1] A waste stream can be a mixture of wastes; consequently, a newly-identified organic TC waste stream can be 1) one or more D018 through D043 wastes (i.e., a mixture of only newly-identified organic TC wastes) or 2) one or more D018 through D043 wastes mixed with other RCRA-defined hazardous wastes or non-hazardous wastes.

Section III. NEWLY-IDENTIFIED ORGANIC TC WASTE STREAMS MANAGED IN LAND DISPOSAL UNITS (LANDFILLS, LAND TREATMENT UNITS, SURFACE IMPOUNDMENTS, WASTE PILES, AND UNDERGROUND INJECTION WELLS) (continued)

A. Waste Description (continued)

Waste Stream No._____
EPA ID No. of Off-site Generator (If applicable)_____

25. Waste description. Provide a short narrative citing source (e.g., type of production process, closure of unit) and generic chemical name or primary organic and hazardous constituents. (For residuals, describe the management procedures resulting in generation of the residual.)

_____
_____
_____
_____

26. List all EPA hazardous waste codes (including newly-identified organic TC wastes and other wastes) contained in the waste stream:

_____ _____ _____ _____ _____ _____

27. Which of the following categories best describes the physical form of the waste?

☐ Liquid: (*Check one of the following*)

__ Wastewater (Contains <1% total organic carbon and <1% total suspended solids)
__ Non-wastewater (All liquids not meeting the wastewater definition)

☐ Pumpable Sludge

☐ Non-pumpable Sludge

☐ Solid

☐ Soil

☐ Debris: Type (*Use Appendix C code(s) or specify type*)

_____

Section III. NEWLY-IDENTIFIED ORGANIC TC WASTE STREAMS MANAGED IN LAND DISPOSAL UNITS (LANDFILLS, LAND TREATMENT UNITS, SURFACE IMPOUNDMENTS, WASTE PILES, AND UNDERGROUND INJECTION WELLS) (continued)

A. Waste Description (continued)

Waste Stream No._____
EPA ID No. of Off-site Generator (if applicable)_____

28. Identify each newly-identified organic TC constituent contained in this waste stream (see Appendix A for a listing of all constituents). If more than five constituents, provide additional information on a separate page. EPA will use this information for assessing the potential treatability of the wastes.

NEWLY-IDENTIFIED ORGANIC TC CONSTITUENT	CONCENTRATION (INCLUDE UNITS)	
	AVERAGE	RANGE
1:		
2:		
3:		
4:		
5:		

29. Identify constituents, other than those mentioned above, that affect the treatability or recovery of this waste stream. If more than five constituents, provide additional information on a separate page. EPA will use this information for assessing the potential treatability of the wastes.

OTHER CONSTITUENT	CONCENTRATION (INCLUDE UNITS)	
	AVERAGE	RANGE
1:		
2:		
3:		
4:		
5:		

Section III. NEWLY-IDENTIFIED ORGANIC TC WASTE STREAMS MANAGED IN LAND DISPOSAL UNITS (LANDFILLS, LAND TREATMENT UNITS, SURFACE IMPOUNDMENTS, WASTE PILES, AND UNDERGROUND INJECTION WELLS) (continued)

A. Waste Description (continued)

Waste Stream No._____
EPA ID No. of Off-site Generator (if applicable)_____

30. Provide data on the chemical composition of the waste that affects the treatability or recovery of the waste stream. Potentially relevant characteristics are provided below.

____ pH level	____ BTU content
____ Flash point	____ Viscosity
____ Solubility (in water)	____ Water content
____ Total organic content	____ Total solids content
____ Total suspended solids	____ Solubility (in solvent): Provide solvent name: ____
____ Chlorides (ppm)	____ Organic and inorganic content
____ Cyanide (ppm)	____ Sulfur
____ Sodium (ppm)	____ Potassium (ppm)
____ Bromines (ppm)	____ Total organic halogen
____ Oil and grease content	____ Other _____

How will the properties that you have indicated above affect the treatability of this waste stream?

_____

_____

31. Type of waste generation for wastewaters and nonwastewaters (excluding soil and debris):

☐ Routine (e.g., continuous industrial activity).

☐ Sporadic (e.g., periodic cleaning of tank bottoms).

☐ Remedial. Provide the type of remedial action conducted:

__ CERCLA
__ RCRA
__ State program
__ Voluntary private party clean-up

Section III. NEWLY-IDENTIFIED ORGANIC TC WASTE STREAMS MANAGED IN LAND DISPOSAL UNITS (LANDFILLS, LAND TREATMENT UNITS, SURFACE IMPOUNDMENTS, WASTE PILES, AND UNDERGROUND INJECTION WELLS) (continued)

A. Waste Description (continued)

Waste Stream No._____
EPA ID No. of Off-site Generator (if applicable)_____

32. Type of waste generation for soil and debris streams:

☐ Routine (e.g., spills, filters, PPE).

☐ Sporadic (e.g., periodic tank cleaning, building decommissioning, plant retrofitting).

☐ Remedial. Provide the type of remedial action conducted:

__ CERCLA
__ RCRA
__ State program
__ Voluntary private party clean-up

33. Quantity managed in on-site land disposal units in 1991:

Quantity of TC wastes (excluding soil and debris): _____ tons gallons (*circle one*)

Quantity of TC-contaminated soil: _____ tons gallons (*circle one*)

Quantity of TC-contaminated debris: _____ tons gallons (*circle one*)

B. Waste Management

34. For this waste stream, indicate in the table below 1) how the waste stream is being managed in land disposal unit (e.g., storage, disposal, treatment or recovery [see Appendix B for system codes]), 2) the type of land disposal unit the waste stream is being managed in (i.e., landfill, land treatment unit, surface impoundment, waste pile, or underground injection well) and 3) the quantity of the waste stream being managed within each land disposal unit in either tons or gallons. If the waste stream is managed in multiple types of land disposal units, indicate each type of unit and the volume of the waste stream being managed in each land disposal unit.

Type of Management	Land Disposal Unit	Quantity	Units

Section III. NEWLY-IDENTIFIED ORGANIC TC WASTE STREAMS MANAGED IN LAND DISPOSAL UNITS (LANDFILLS, LAND TREATMENT UNITS, SURFACE IMPOUNDMENTS, WASTE PILES, AND UNDERGROUND INJECTION WELLS) (continued)

C. Waste Minimization

Only complete this section for waste streams generated on site.

Waste Stream No._____

35. Do you plan to begin waste minimization activities or expand existing waste minimization activities that may, in the future, result in a decrease in the waste stream?

☐ Yes: *Answer questions 36 - 41. (Use your best judgement)*

☐ No: *Proceed to next waste stream.*

36. Indicate type of activity:

__ Equipment or technology modification/substitution
__ Process or procedure modification/substitution
__ Reformulation or redesign of product
__ Modification/substitution of raw material
__ Improved efficiency of operations
__ Waste stream segregation
__ Recycling or recovery for reuse
__ Closed loop recycling
__ Other:_____

37. Provide a brief description of the activity:

_____
_____
_____

38. Provide date when activity will begin. _____

39. Provide an estimate of the annual reduction in the generation of waste as a result of this activity. Quantity: _____ Unit of measure: tons gallons (*circle one*).

40. Describe any changes in the physical and/or chemical characteristics of the newly-identified organic TC-waste stream as a result of this activity:

_____
_____

41. Will these changes result in the waste stream no longer being:

☐ A newly-identified organic TC hazardous waste?

☐ A RCRA hazardous waste?

Section IV. TREATMENT OR RECOVERY SYSTEMS FOR MANAGING NEWLY-IDENTIFIED ORGANIC TC WASTES

Did the facility treat or recover newly-identified organic TC wastes, including TC-contaminated soil and debris, in 1991 or does the facility have plans to treat or recover newly identified TC wastes, including TC-contaminated soil and debris, during 1992 to 1995?

☐ Yes: *Copy and complete Section IV for each treatment or recovery system used for or planned to be used for managing the newly-identified organic TC wastes. For planned uses of a particular system, only indicate those treatment or recovery systems, that in your judgement, are appropriate for managing organics and are capable of treating the wastes to the characteristic levels. Assign a unique number to each system and indicate the number on each page.*

☐ No: *Proceed to Section V.*

This section requests information on on-site treatment or recovery systems that are being used or could be used to manage organic TC wastes. Following promulgation of the LDRs for TC wastes, some on-site systems will be used to treat wastes that are currently being managed in land disposal units. We will use the information in this section to determine the availability of on-site treatment systems for managing TC wastes requiring treatment following promulgation of the LDRs. Therefore, based on this information, we will adjust the total national volumes of TC waste that will require off-site commercial treatment. Although we use facility-specific information for the capacity analysis, we are not making any judgements on how your facility will actually manage wastes following promulgation of the LDRs (i.e., our use of the information is for analytical purposes only).

For each treatment or recovery system, Questions 42 through 53 request information on the operational status of the system, the types and quantities of wastes being managed, and the limitations and potential obstacles in the use of the system for TC wastes. Questions 54 through 56 address whether the system can treat newly-identified organic TC wastes to or below the characteristic levels.

Section IV. TREATMENT OR RECOVERY SYSTEMS FOR MANAGING NEWLY-IDENTIFIED ORGANIC TC WASTES

System No.____

42. General description of the system.[1] (*Include a description of the processes in this system*)

_____

_____

_____

43. System type: (*Use Appendix B codes or specify system*) _____

44. Is this system subject to RCRA permit requirements?

- ☐ No: This system is exempt from RCRA permit requirements.
- ☐ Yes: All or part of this system is subject to RCRA permit requirements.
  Describe the parts requiring a RCRA permit: _____

  _____

45. Current operational status :

- ☐ Operational (includes routine downtime for standard operating procedures, slack demand, and normal maintenance).
- ☐ Temporarily idle (e.g., non-routine downtime such as major repair).
- ☐ Under construction. Expected completion date: _____
- ☐ Planned, not yet under construction. Expected completion date: _____
- ☐ Permanently closed.

[1]A system is one or more processes linked together to treat or recover hazardous wastes (
Appendix B for examples).

Section IV. TREATMENT OR RECOVERY SYSTEMS FOR MANAGING NEWLY-IDENTIFIED ORGANIC TC WASTES (continued)

System No.____

46. Commercial status of system: (*Check all that apply*)

- ☐ The system is or will be available only for management of hazardous waste generated on site.
- ☐ The system is or will be available only to firms owned by the same company.
- ☐ The system is or will be available to a limited group of establishments for commercial hazardous waste management. Percent available commercially: _____
- ☐ The system is or will be available to any firm or establishment for commercial hazardous waste management.
- ☐ Other. Please describe: _____

47. List all RCRA waste codes entering the system in 1991: (*Leave blank if system is in planning stages or is not currently being used for newly identified organic TC wastes.*)

_____ _____ _____ _____ _____ _____

48. Quantity of wastes entering system in 1991. Units: tons gallons (*circle one*)

(*Leave blank if system is in planning stages.*)

Total[1]:	_____	RCRA Total:	_____
Liquids:	_____	Liquids:	_____
Solids/sludges[2]:	_____	Solid/sludges[2]:	_____
Soil:	_____	Soil:	_____
Debris:	_____	Debris:	_____

49. Maximum operational capacity (*same units as above*):

Total[1]:	_____	RCRA Total:	_____
Liquids:	_____	Liquids:	_____
Solid/sludges[2]:	_____	Solid/sludges[2]:	_____
Soil:	_____	Soil:	_____
Debris:	_____	Debris:	_____

[1] Total includes both RCRA hazardous and non-hazardous wastes.
[2] Quantity should include both solids and sludges, but not include soil and debris.

Section IV. TREATMENT OR RECOVERY SYSTEMS FOR MANAGING NEWLY-IDENTIFIED ORGANIC TC WASTES (continued)

System No.____

50. Physical forms of wastes that the system is capable of treating or recovering: (*Check all that apply*)

☐ Wastewater ☐ Soil

☐ Nonwastewater ☐ Debris

51. Do you plan to make any changes in the operational capacity of this system during 1992-1995 (including changes in operational status)?

☐ No.

☐ Yes: Please provide year of changes and description of changes, including any change in the maximum operational capacity.

_____

_____

_____

52. Are there any special limitations of the system (e.g., seasonality of operation, pumpability of waste being managed, water content of waste)?

☐ No.

☐ Yes: Please provide a brief description.

_____

_____

_____

53. Are there any special materials handling problems in managing contaminated soil or debris in this system (e.g., is grinding or shredding required prior to treatment)?

☐ No.

☐ Yes: Please provide a brief description.

_____

_____

_____

Section IV. TREATMENT OR RECOVERY SYSTEMS FOR MANAGING NEWLY-IDENTIFIED ORGANIC TC WASTES (continued)

System No.____

EPA is examining two approaches for setting treatment standards for newly-identified organic TC wastes: 1) treatment standard levels would be at the characteristic level for the TC constituent; and 2) treatment standards may be below the characteristic level for the TC constituent (e.g., at the concentration levels for F039 wastes).

54. Can the system, as currently operating or planned, treat newly-identified organic TC wastes TO the characteristic levels (CFR 261.24)?

☐ Yes

☐ No

☐ Not sure

55. In general, can the system treat newly-identified organic TC wastes BELOW the characteristic levels? (Use your best judgement and, for the purpose of this question, consider the "lower than characteristic levels" to be those for F039 wastes.)

☐ Yes (*Proceed to the next system*)

☐ No (*Continue to question 56*)

☐ Not sure (*Continue to question 56*)

56. Please list the specific waste codes whose treated levels may be above those for F039 wastes. (*Use your best judgement*)

_____ _____ _____ _____ _____

57. Please indicate the types of modifications, if any, that could be made to the system such that the wastes could be treated to below the characteristic levels. Also include an estimate of the time required to complete the modifications and obtain necessary permits.

_____

_____

_____

_____

Section V. ADDITIONAL INFORMATION

58. In the Federal Register notice of October 24, 1991 (56 Federal Register 55160) EPA has indicated plans to develop land disposal restrictions (LDRs) for newly-identified organic TC wastes. Please describe any unique factors at your facility that could potentially affect the generation or management of these wastes after the LDRs are effective. Also please provide any additional information that you want to be considered in EPA's evaluation of the capacity impacts of the LDR rule.

Section V. ADDITIONAL INFORMATION (continued)

59. Please provide information on any changes you foresee in the future generation or management of newly-identified organic TC wastes (e.g., wastes generated as a result of future corrective actions). Please focus on any changes that will likely occur before the end of 1995.

60. Would you like to receive information summarizing the results of EPA's data collection effort?

☐ Yes

☐ No

APPENDIX A
NEWLY-IDENTIFIED ORGANIC TC HAZARDOUS WASTE CODES AND THEIR CONSTITU

EPA Hazardous Waste Code	Constituent
D018	Benzene
D019	Carbon tetrachloride
D020	Chlordane
D021	Chlorobenzene
D022	Chloroform
D023	o-Cresol
D024	m-Cresol
D025	p-Cresol
D026	Cresol
D027	1,4-Dichlorobenzene
D028	1,2-Dichloroethane
D029	1,1-Dichloroethylene
D030	2,4-Dinitrotoluene
D031	Heptachlor
D032	Hexachlorobenzene
D033	Hexachloro-1,3-butadiene
D034	Hexachloroethane
D035	Methyl ethyl ketone
D036	Nitrobenzene
D037	Pentachlorophenol
D038	Pyridine
D039	Tetrachloroethylene
D040	Trichloroethylene
D041	2,3,5-Trichlorophenol
D042	2,4,6-Trichlorophenol
D043	Vinyl Chloride

Source: 40 CFR 261.24

APPENDIX B
POTENTIAL ORGANIC TC TREATMENT OR RECOVERY SYSTEMS

Code	Treatment or Recovery System
	Combustion Systems
01	Boiler
02	Industrial furnace
03	Incinerator
	Wastewater Treatment Systems
04	Air flotation
05	Biological Treatment
06	Carbon Adsorption
07	Chemical Oxidation
08	Evaporation
09	Filtration
10	Oil Skimming
11	Wet Air Oxidation
12	Other Oxidation
13	Sludge Dewatering
14	Air stripping
15	Steam stripping
	Organics Recovery Systems
16	Solvent Extraction
17	Thin Film Evaporation
18	Distillation (batch or fractional)
19	Other organics recovery, specify:
	Other Wastewater Treatment Systems
20	Biological Treatment and Chemical Precipitation
21	Chemical Precipitation and Carbon Adsorption
22	Chemical Oxidation and Chemical Precipitation
23	Biological Treatment and Carbon Adsorption

APPENDIX B
POTENTIAL ORGANIC TC TREATMENT OR RECOVERY SYSTEMS

Code	Treatment or Recovery System
	Soil Treatment Systems
24	Chemical Extraction
25	Soil Washing
26	Dechlorination
27	Low-Temperature Thermal Desorption
28	High-Temperature Distillation
29	Thermal Destruction
30	Stabilization
31	Vitrification

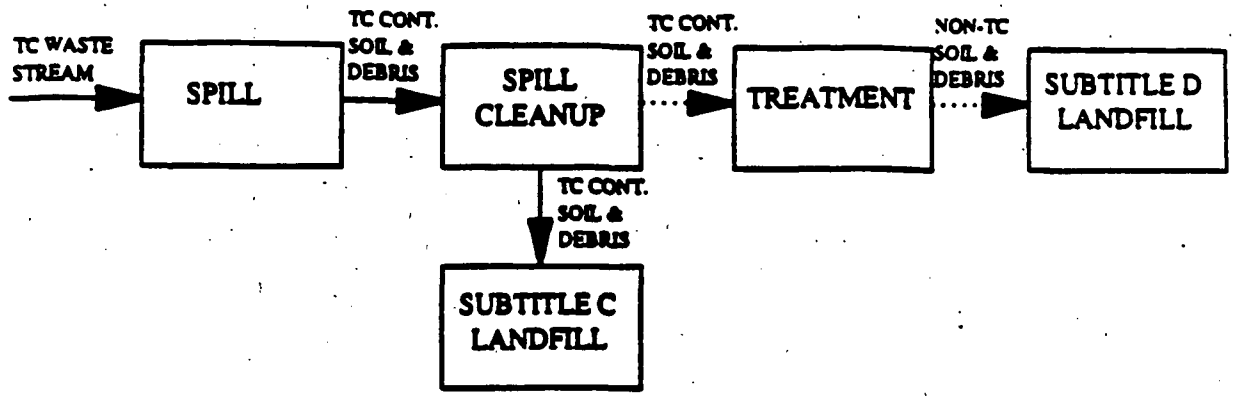
APPENDIX C
DEBRIS TYPES

Code	Debris Type
01	Asbestos
02	Intact Batteries
03	Battery Cases
04	Bricks, Refractory
05	Bricks, Other
06	Ceramics
07	Cloth
08	Concrete
09	Electrical Wires, Switches, Etc.
10	Electronic Components
11	Equipment and Structures
12	Filter Cartridges
13	Glass
14	Metallics
15	Paper or Cardboard
16	Personal Protection Equipment
17	Plastics, Not Otherwise Specified
18	PVC Pipe
19	Rock or Other Non-Soil Geologic Material
20	Rubber Objects
21	Slag
22	Wood

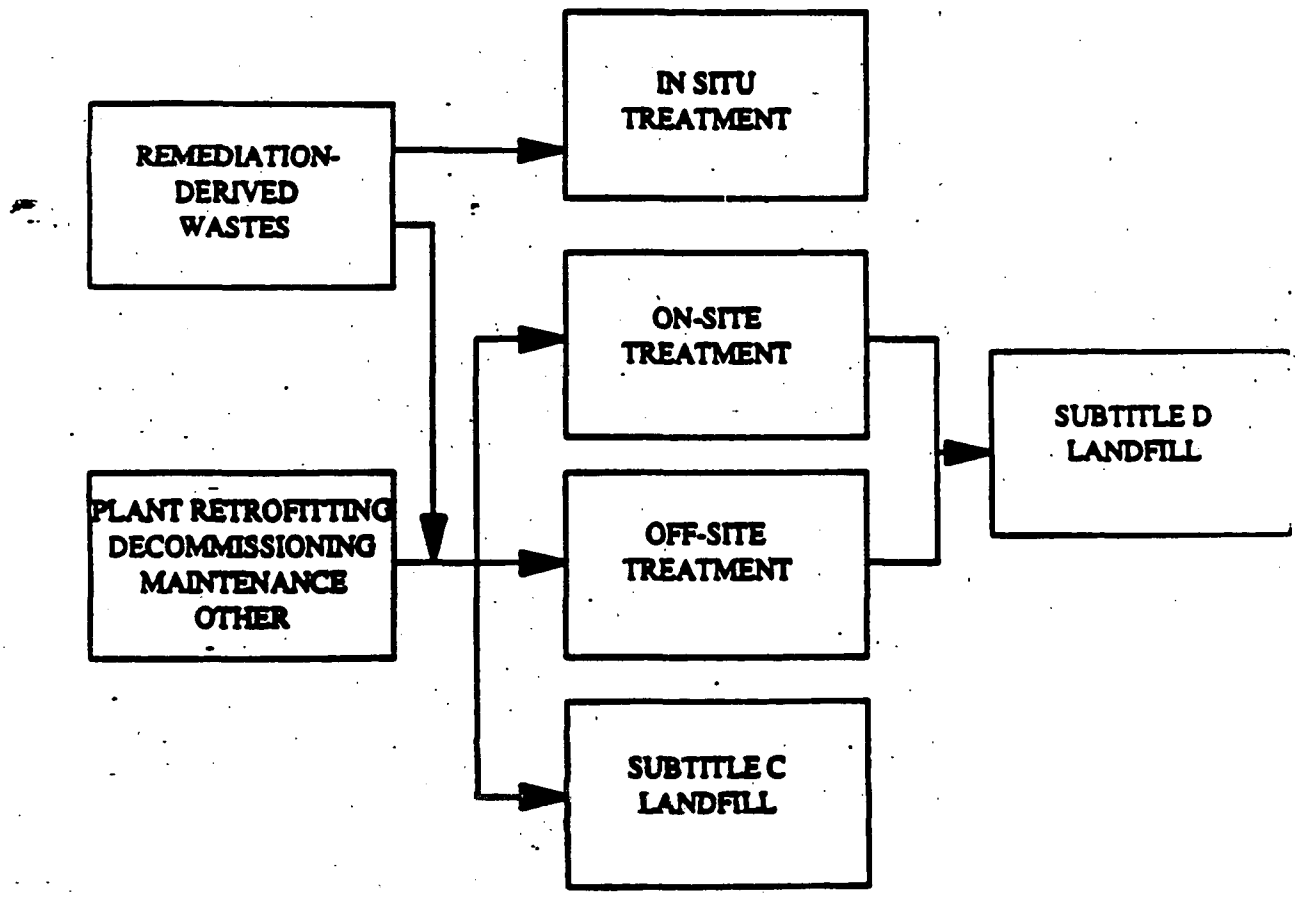
APPENDIX D
SAMPLE BLOCK DIAGRAMS

TC-CONTAMINATED SOIL AND DEBRIS MANAGMENT

ROUTINE GENERATION

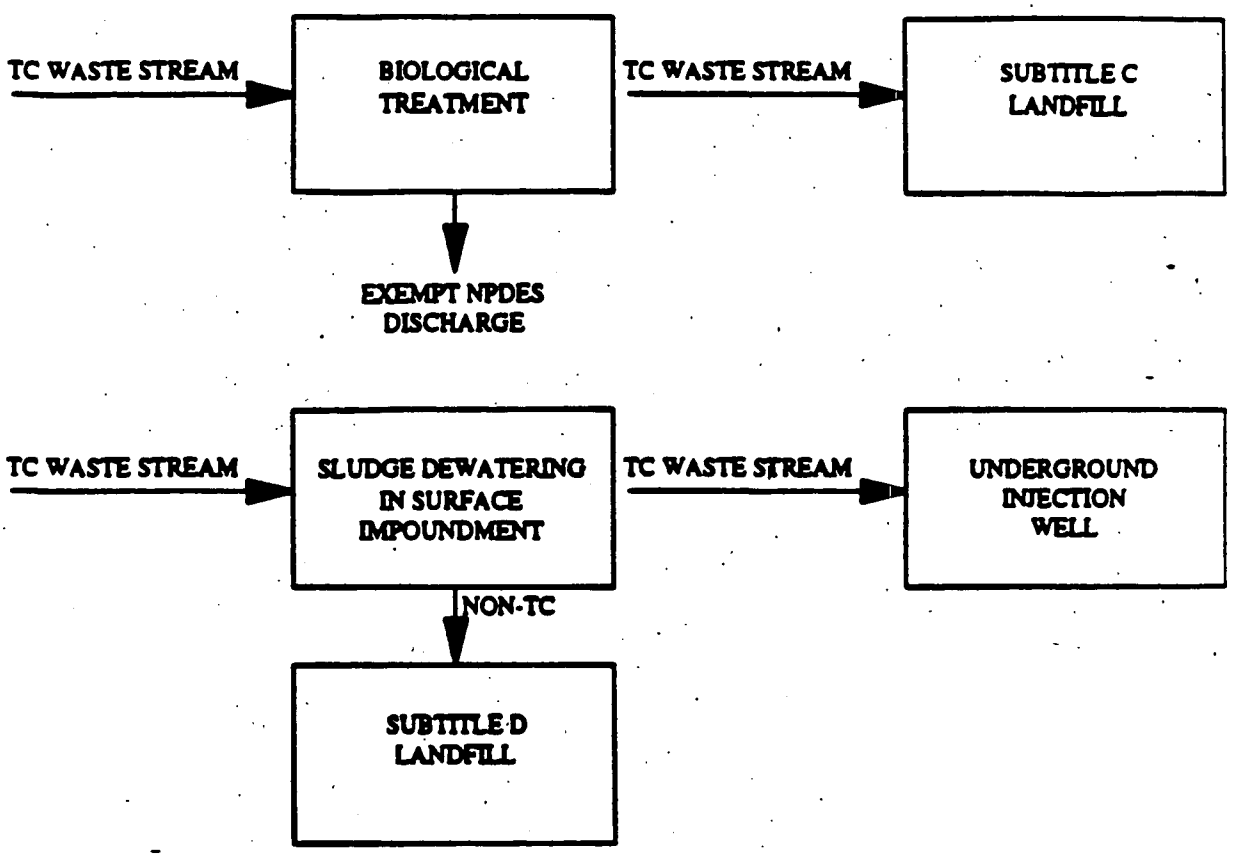


SPORADIC AND REMEDIAL GENERATION



APPENDIX D
SAMPLE BLOCK DIAGRAMS

TC PROCESS WASTE



APPENDIX B
ANALYSIS OF UTS IMPACTS
WASTESTREAMS WITH CHANGING TREATMENT STANDARDS

WST_CODE=F001-F005

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
1	75150	CARBON DISULFIDE	E	4.800	.	.	STANDARD PENDING
2	108941	CYCLOHEXANONE	E	0.750	.	.	STANDARD PENDING
3	67561	METHANOL	E	0.750	.	.	STANDARD PENDING
4	95501	(O)1,2-DICHLOROBENZENE	W	6.200	6.000	-0.01	MODERATE CHANGE
5	71556	1,1,1-TRICHLOROETHANE	W	5.600	6.000	0.03	MODERATE CHANGE
6	76131	1,1,2-TRICHLORO-1,2,2-TRIFLU	W	28.000	30.000	0.03	MODERATE CHANGE
7	79005	1,1,2-TRICHLOROETHANE	W	7.600	6.000	-0.10	MODERATE CHANGE
8	67641	ACETONE	W	160.000	160.000	0.00	UNCHANGED
9	71432	BENZENE	W	3.700	10.000	0.43	MODERATE CHANGE
10	56235	CARBON TETRACHLORIDE	W	5.600	6.000	0.03	MODERATE CHANGE
11	108907	CHLOROBENZENE	W	5.700	6.000	0.02	MODERATE CHANGE
12	99900016	CRESOLS (M AND P ISOMERS)	W	3.200	3.200	0.00	UNCHANGED
13	141786	ETHYL ACETATE	W	33.000	33.000	0.00	UNCHANGED
14	100414	ETHYL BENZENE	W	6.000	10.000	0.22	MODERATE CHANGE
15	60297	ETHYL ETHER	W	160.000	160.000	0.00	UNCHANGED
16	78831	ISOBUTYL ALCOHOL	W	170.000	170.000	0.00	UNCHANGED
17	78933	METHYL ETHYL KETONE	W	36.000	36.000	0.00	UNCHANGED
18	108101	METHYL ISOBUTYL KETONE	W	33.000	33.000	0.00	UNCHANGED
19	75092	METHYLENE CHLORIDE	W	33.000	30.000	-0.04	MODERATE CHANGE
20	71363	N-BUTYL ALCOHOL	W	2.600	2.600	0.00	UNCHANGED
21	98953	NITROBENZENE	W	14.000	14.000	0.00	UNCHANGED
22	95487	O-CRESOL (2-METHYLPHENOL)	W	5.600	5.600	0.00	UNCHANGED
23	110861	PYRIDINE	W	16.000	16.000	0.00	UNCHANGED
24	127184	TETRACHLOROETHENE	W	5.600	6.000	0.03	MODERATE CHANGE
25	108883	TOLUENE	W	28.000	10.000	-0.45	MODERATE CHANGE
26	79016	TRICHLOROETHENE	W	5.600	6.000	0.03	MODERATE CHANGE
27	75694	TRICHLOROMONOFLUOROMETHANE	W	33.000	30.000	-0.04	MODERATE CHANGE
28	1330207	XYLENES (TOTAL)	W	28.000	30.000	0.03	MODERATE CHANGE

WST_CODE=F006

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
29	7440439	CADMIUM	E	0.066	0.190	0.46	MODERATE CHANGE
30	7440473	CHROMIUM (TOTAL)	E	5.200	0.330	-1.20	MODERATE CHANGE
31	7439921	LEAD	E	0.510	0.370	-0.14	MODERATE CHANGE
32	7440020	NICKEL	E	0.320	5.000	1.19	MODERATE CHANGE
33	7440224	SILVER	E	0.072	0.300	0.62	MODERATE CHANGE
34	57125	CYANIDE (AMENABLE)	W	30.000	30.000	0.00	UNCHANGED
35	57125	CYANIDE (TOTAL)	W	590.000	590.000	0.00	UNCHANGED

WST_CODE=F007

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
36	7440439	CADMIUM	E	0.066	0.190	0.46	MODERATE CHANGE
37	7440473	CHROMIUM (TOTAL)	E	5.200	0.330	-1.20	MODERATE CHANGE
38	7439921	LEAD	E	0.510	0.370	-0.14	MODERATE CHANGE
39	7440020	NICKEL	E	0.320	5.000	1.19	MODERATE CHANGE
40	7440224	SILVER	E	0.072	0.300	0.62	MODERATE CHANGE
41	57125	CYANIDE (AMENABLE)	W	30.000	30.000	0.00	UNCHANGED
42	57125	CYANIDE (TOTAL)	W	590.000	590.000	0.00	UNCHANGED

WST_CODE=F008

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
43	7440439	CADMIUM	E	0.066	0.190	0.46	MODERATE CHANGE
44	7440473	CHROMIUM (TOTAL)	E	5.200	0.330	-1.20	MODERATE CHANGE
45	7439921	LEAD	E	0.510	0.370	-0.14	MODERATE CHANGE
46	7440020	NICKEL	E	0.320	5.000	1.19	MODERATE CHANGE
47	7440224	SILVER	E	0.072	0.300	0.62	MODERATE CHANGE
48	57125	CYANIDE (AMENABLE)	W	30.000	30.000	0.00	UNCHANGED
49	57125	CYANIDE (TOTAL)	W	590.000	590.000	0.00	UNCHANGED

APPENDIX B
ANALYSIS OF UTS IMPACTS
WASTESTREAMS WITH CHANGING TREATMENT STANDARDS

WST_CODE=F009

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
50	7440439	CADMIUM	E	0.066	0.190	0.46	MODERATE CHANGE
51	7440473	CHROMIUM (TOTAL)	E	5.200	0.330	-1.20	MODERATE CHANGE
52	7439921	LEAD	E	0.510	0.370	-0.14	MODERATE CHANGE
53	7440020	NICKEL	E	0.320	5.000	1.19	MODERATE CHANGE
54	7440224	SILVER	E	0.072	0.300	0.62	MODERATE CHANGE
55	57125	CYANIDE (AMENABLE)	W	30.000	30.000	0.00	UNCHANGED
56	57125	CYANIDE (TOTAL)	W	590.000	590.000	0.00	UNCHANGED

WST_CODE=F010

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
57	57125	CYANIDE (TOTAL)	W	1.500	590.000	2.59	SIGNIF. LESS STRING

WST_CODE=F011

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
58	7440439	CADMIUM	E	0.066	0.190	0.46	MODERATE CHANGE
59	7440473	CHROMIUM (TOTAL)	E	5.200	0.330	-1.20	MODERATE CHANGE
60	7439921	LEAD	E	0.510	0.370	-0.14	MODERATE CHANGE
61	7440020	NICKEL	E	0.320	5.000	1.19	MODERATE CHANGE
62	7440224	SILVER	E	0.072	0.300	0.62	MODERATE CHANGE
63	57125	CYANIDE (AMENABLE)	W	9.100	30.000	0.52	MODERATE CHANGE
64	57125	CYANIDE (TOTAL)	W	110.000	590.000	0.73	MODERATE CHANGE

WST_CODE=F012

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
65	7440439	CADMIUM	E	0.066	0.190	0.46	MODERATE CHANGE
66	7440473	CHROMIUM (TOTAL)	E	5.200	0.330	-1.20	MODERATE CHANGE
67	7439921	LEAD	E	0.510	0.370	-0.14	MODERATE CHANGE
68	7440020	NICKEL	E	0.320	5.000	1.19	MODERATE CHANGE
69	7440224	SILVER	E	0.072	0.300	0.62	MODERATE CHANGE
70	57125	CYANIDE (AMENABLE)	W	9.100	30.000	0.52	MODERATE CHANGE
71	57125	CYANIDE (TOTAL)	W	110.000	590.000	0.73	MODERATE CHANGE

WST_CODE=F019

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
72	7440473	CHROMIUM (TOTAL)	E	5.200	0.330	-1.20	MODERATE CHANGE
73	57125	CYANIDE (AMENABLE)	W	30.000	30.000	0.00	UNCHANGED
74	57125	CYANIDE (TOTAL)	W	590.000	590.000	0.00	UNCHANGED

WST_CODE=F020-F023 AND F026-F028

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
75	58902	2,3,4,6-TETRACHLOROPHENOL	E	0.050	.	.	STANDARD PENDING
76	95954	2,4,5-TRICHLOROPHENOL	E	0.001	.	.	STANDARD PENDING
77	88062	2,4,6-TRICHLOROPHENOL	E	0.050	.	.	STANDARD PENDING
78	99900004	HEXACHLORODIBENZO-P-DIOXINS	E	0.001	.	.	STANDARD PENDING
79	99900003	HEXACHLORODIBENZOFURANS	E	0.001	.	.	STANDARD PENDING
80	99900006	PENTACHLORDIBENZO-P-DIOXINS	E	0.001	.	.	STANDARD PENDING
81	99900007	PENTACHLORODIBENZOFURANS	E	0.001	.	.	STANDARD PENDING
82	87865	PENTACHLOROPHENOL	E	0.010	.	.	STANDARD PENDING
83	99900010	TETRACHLORODIBENZO-P-DIOXINS	E	0.001	.	.	STANDARD PENDING
84	99900009	TETRACHLORODIBENZOFURANS	E	0.001	.	.	STANDARD PENDING

APPENDIX B
ANALYSIS OF UTS IMPACTS
WASTESTREAMS WITH CHANGING TREATMENT STANDARDS

WST_CODE=F024

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
85	7440473	CHROMIUM (TOTAL)	E	0.073	0.330	0.66	MODERATE CHANGE
86	7440020	NICKEL	E	0.088	5.000	1.75	SIGNIF. LESS STRINGENT
87	75343	1,1-DICHLOROETHANE	W	0.014	6.000	2.63	SIGNIF. LESS STRINGENT
88	107062	1,2-DICHLOROETHANE	W	0.014	6.000	2.63	SIGNIF. LESS STRINGENT
89	78875	1,2-DICHLOROPROPANE	W	0.014	18.000	3.11	SIGNIF. LESS STRINGENT
90	126998	2-CHLORO-1,3-BUTADIENE	W	0.280	.	.	STANDARD PENDING
91	107051	3-CHLOROPROPENE	W	0.280	30.000	2.03	SIGNIF. LESS STRINGENT
92	117817	BIS(2-ETHYLHEXYL)PHTHALATE	W	1.800	28.000	1.19	MODERATE CHANGE
93	10061026	CIS-1,3-DICHLOROPROPENE	W	0.014	18.000	3.11	SIGNIF. LESS STRINGENT
94	67721	HEXACHLOROETHANE	W	1.800	30.000	1.22	MODERATE CHANGE
95	10061015	TRANS-1,3-DICHLOROPROPENE	W	0.014	18.000	3.11	SIGNIF. LESS STRINGENT

WST_CODE=F025 (ACIDS)

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
96	79005	1,1,2-TRICHLOROETHANE	W	6.200	6.000	-0.01	MODERATE CHANGE
97	56235	CARBON TETRACHLORIDE	W	6.200	6.000	-0.01	MODERATE CHANGE
98	67663	CHLOROFORM	W	6.200	6.000	-0.01	MODERATE CHANGE
99	118741	HEXACHLOROBENZENE	W	37.000	10.000	-0.57	MODERATE CHANGE
100	87683	HEXACHLOROBUTADIENE	W	28.000	5.600	-0.70	MODERATE CHANGE
101	67721	HEXACHLOROETHANE	W	30.000	30.000	0.00	UNCHANGED
102	75092	METHYLENE CHLORIDE	W	31.000	30.000	-0.01	MODERATE CHANGE
103	79016	TRICHLOROETHENE	W	5.600	6.000	0.03	MODERATE CHANGE
104	75014	VINYL CHLORIDE	W	33.000	6.000	-0.74	MODERATE CHANGE

WST_CODE=F025 (LIGHT ENDS)

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
105	79005	1,1,2-TRICHLOROETHANE	W	6.200	6.000	-0.01	MODERATE CHANGE
106	75354	1,1-DICHLOROETHYLENE	W	6.200	6.000	-0.01	MODERATE CHANGE
107	107062	1,2-DICHLOROETHANE	W	6.200	6.000	-0.01	MODERATE CHANGE
108	56235	CARBON TETRACHLORIDE	W	6.200	6.000	-0.01	MODERATE CHANGE
109	67663	CHLOROFORM	W	6.200	6.000	-0.01	MODERATE CHANGE
110	75092	METHYLENE CHLORIDE	W	31.000	30.000	-0.01	MODERATE CHANGE
111	79016	TRICHLOROETHENE	W	5.600	6.000	0.03	MODERATE CHANGE
112	75014	VINYL CHLORIDE	W	33.000	6.000	-0.74	MODERATE CHANGE

WST_CODE=F037

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
113	7440473	CHROMIUM (TOTAL)	E	1.700	.	.	STANDARD PENDING
114	7440020	NICKEL	E	0.200	5.000	1.40	SIGNIF. LESS STRINGENT
115	120127	ANTHRACENE	W	28.000	3.400	-0.92	MODERATE CHANGE
116	56553	BENZ(A)ANTHRACENE	W	20.000	3.400	-0.77	MODERATE CHANGE
117	71432	BENZENE	W	14.000	10.000	-0.15	MODERATE CHANGE
118	50328	BENZO(A)PYRENE	W	12.000	3.400	-0.55	MODERATE CHANGE
119	117817	BIS(2-ETHYLHEXYL)PHTHALATE	W	7.300	28.000	0.58	MODERATE CHANGE
120	218019	CHRYSENE	W	15.000	3.400	-0.64	MODERATE CHANGE
121	57125	CYANIDE (TOTAL)	W	1.800	590.000	2.52	SIGNIF. LESS STRINGENT
122	84742	DI-N-BUTYL PHTHALATE	W	3.600	28.000	0.89	MODERATE CHANGE
123	100414	ETHYL BENZENE	W	14.000	10.000	-0.15	MODERATE CHANGE
124	91203	NAPHTHALENE	W	42.000	5.600	-0.88	MODERATE CHANGE
125	85018	PHENANTHRENE	W	34.000	5.600	-0.78	MODERATE CHANGE
126	108952	PHENOL	W	3.600	6.200	0.24	MODERATE CHANGE
127	129000	PYRENE	W	36.000	8.200	-0.64	MODERATE CHANGE
128	108883	TOLUENE	W	14.000	10.000	-0.15	MODERATE CHANGE
129	1330207	XYLENES (TOTAL)	W	0.320	30.000	1.97	SIGNIF. LESS STRINGENT

APPENDIX B
ANALYSIS OF UTS IMPACTS
WASTESTREAMS WITH CHANGING TREATMENT STANDARDS

WST_CODE=F038

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
130	7440473	CHROMIUM (TOTAL)	E	1.700	.	.	STANDARD PENDING
131	7440020	NICKEL	E	0.200	5.000	1.40	SIGNIF. LESS STRIN
132	71432	BENZENE	W	14.000	10.000	-0.15	MODERATE CHANGE
133	50328	BENZO(A)PYRENE	W	12.000	3.400	-0.55	MODERATE CHANGE
134	117817	BIS(2-ETHYLHEXYL)PHTHALATE	W	7.300	28.000	0.58	MODERATE CHANGE
135	218019	CHRYSENE	W	15.000	3.400	-0.64	MODERATE CHANGE
136	57125	CYANIDE (TOTAL)	W	1.800	590.000	2.52	SIGNIF. LESS STRIN
137	84742	DI-N-BUTYL PHTHALATE	W	3.600	28.000	0.89	MODERATE CHANGE
138	100414	ETHYL BENZENE	W	14.000	10.000	-0.15	MODERATE CHANGE
139	91203	NAPHTHALENE	W	42.000	5.600	-0.88	MODERATE CHANGE
140	85018	PHENANTHRENE	W	34.000	5.600	-0.78	MODERATE CHANGE
141	108952	PHENOL	W	3.600	6.200	0.24	MODERATE CHANGE
142	129000	PYRENE	W	36.000	8.200	-0.64	MODERATE CHANGE
143	108883	TOLUENE	W	14.000	10.000	-0.15	MODERATE CHANGE
144	1330207	XYLENES (TOTAL)	W	22.000	30.000	0.13	MODERATE CHANGE

WST_CODE=F039

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
145	7440360	ANTIMONY	E	0.230	2.100	0.96	MODERATE CHANGE
146	7440382	ARSENIC	E	5.000	5.000	0.00	UNCHANGED
147	7440393	BARIUM	E	52.000	7.600	-0.84	MODERATE CHANGE
148	7440439	CADMIUM	E	0.066	0.190	0.46	MODERATE CHANGE
149	7440473	CHROMIUM (TOTAL)	E	5.200	0.330	-1.20	MODERATE CHANGE
150	7439921	LEAD	E	0.510	0.370	-0.14	MODERATE CHANGE
151	7439976	MERCURY	E	0.025	0.009	-0.44	MODERATE CHANGE
152	7440020	NICKEL	E	0.320	5.000	1.19	MODERATE CHANGE
153	7782492	SELENIUM	E	5.700	0.160	-1.55	SIGNIF. MORE STRIN
154	7440224	SILVER	E	0.072	0.300	0.62	MODERATE CHANGE
155	541731	(M)1,3-DICHLOROBENZENE	W	6.200	6.000	-0.01	MODERATE CHANGE
156	95501	(O)1,2-DICHLOROBENZENE	W	6.200	6.000	-0.01	MODERATE CHANGE
157	106467	(P)1,4-DICHLOROBENZENE	W	6.200	6.000	-0.01	MODERATE CHANGE
158	630206	1,1,1,2-TETRACHLOROETHANE	W	42.000	6.000	-0.85	MODERATE CHANGE
159	71556	1,1,1-TRICHLOROETHANE	W	5.600	6.000	0.03	MODERATE CHANGE
160	79345	1,1,2,2-TETRACHLOROETHANE	W	42.000	6.000	-0.85	MODERATE CHANGE
161	76131	1,1,2-TRICHLORO-1,2,2-TRIFLU	W	28.000	30.000	0.03	MODERATE CHANGE
162	79005	1,1,2-TRICHLOROETHANE	W	5.600	6.000	0.03	MODERATE CHANGE
163	75343	1,1-DICHLOROETHANE	W	7.200	6.000	-0.08	MODERATE CHANGE
164	75354	1,1-DICHLOROETHYLENE	W	33.000	6.000	-0.74	MODERATE CHANGE
165	96184	1,2,3-TRICHLOROPROPANE	W	28.000	30.000	0.03	MODERATE CHANGE
166	95943	1,2,4,5-TETRACHLOROBENZENE	W	19.000	14.000	-0.13	MODERATE CHANGE
167	120821	1,2,4-TRICHLOROBENZENE	W	19.000	19.000	0.00	UNCHANGED
168	96128	1,2-DIBROMO-3-CHLOROPROPANE	W	15.000	15.000	0.00	UNCHANGED
169	106934	1,2-DIBROMOETHANE	W	15.000	15.000	0.00	UNCHANGED
170	107062	1,2-DICHLOROETHANE	W	7.200	6.000	-0.08	MODERATE CHANGE
171	78875	1,2-DICHLOROPROPANE	W	18.000	18.000	0.00	UNCHANGED
172	123911	1,4 - DIOXANE	W	170.000	170.000	0.00	UNCHANGED
173	100254	1,4-DINITROBENZENE	W	2.300	2.300	0.00	UNCHANGED
174	58902	2,3,4,6-TETRACHLOROPHENOL	W	37.000	7.400	-0.70	MODERATE CHANGE
175	93765	2,4,5- (T) TRICHLOROPHENOXYA	W	7.900	7.900	0.00	UNCHANGED
176	95954	2,4,5-TRICHLOROPHENOL	W	37.000	7.400	-0.70	MODERATE CHANGE
177	88062	2,4,6-TRICHLOROPHENOL	W	37.000	7.400	-0.70	MODERATE CHANGE
178	94757	2,4- (D) DICHLOROPHENOXY ACE	W	10.000	10.000	0.00	UNCHANGED
179	120832	2,4-DICHLOROPHENOL	W	14.000	14.000	0.00	UNCHANGED
180	105679	2,4-DIMETHYLPHENOL	W	14.000	14.000	0.00	UNCHANGED
181	51285	2,4-DINITROPHENOL	W	160.000	160.000	0.00	UNCHANGED
182	121142	2,4-DINITROTOLUENE	W	140.000	140.000	0.00	UNCHANGED
183	87650	2,6-DICHLOROPHENOL	W	14.000	14.000	0.00	UNCHANGED
184	606202	2,6-DINITROTOLUENE	W	28.000	28.000	0.00	UNCHANGED
185	53963	2-ACETYLAMINOFLUORENE	W	140.000	140.000	0.00	UNCHANGED
186	91587	2-CHLORONAPHTHALENE	W	5.600	5.600	0.00	UNCHANGED
187	95578	2-CHLOROPHENOL	W	5.700	5.700	0.00	UNCHANGED
188	88857	2-SEC-BUTYL-4,6-DINITROPHENO	W	2.500	2.500	0.00	UNCHANGED
189	107051	3-CHLOROPROPENE	W	28.000	30.000	0.03	MODERATE CHANGE
190	56495	3-METHYLCHOLANTHRENE	W	15.000	15.000	0.00	UNCHANGED
191	101144	4,4'-METHYLENE-BIS-(2-CHLORO	W	35.000	30.000	-0.07	MODERATE CHANGE
192	534521	4,6-DINITRO-O-CRESOL	W	160.000	160.000	0.00	UNCHANGED
193	101553	4-BROMOPHENYL PHENYL ETHER	W	15.000	15.000	0.00	UNCHANGED
194	100027	4-NITROPHENOL	W	29.000	29.000	0.00	UNCHANGED
195	208968	ACENAPHTHALENE	W	3.400	3.400	0.00	UNCHANGED
196	83329	ACENAPHTHENE	W	4.000	3.400	-0.07	MODERATE CHANGE
197	67641	ACETONE	W	160.000	160.000	0.00	UNCHANGED
198	309002	ALDRIN	W	0.066	0.066	0.00	UNCHANGED

APPENDIX B
ANALYSIS OF UTS IMPACTS
WASTESTREAMS WITH CHANGING TREATMENT STANDARDS

WST_CODE=F039
(continued)

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
199	319846	ALPHA - BHC	W	0.066	0.066	0.00	UNCHANGED
200	62533	ANILINE	W	14.000	14.000	0.00	UNCHANGED
201	120127	ANTHRACENE	W	4.000	3.400	-0.07	MODERATE CHANGE
202	56553	BENZ(A)ANTHRACENE	W	8.200	3.400	-0.38	MODERATE CHANGE
203	71432	BENZENE	W	36.000	10.000	-0.56	MODERATE CHANGE
204	50328	BENZO(A)PYRENE	W	8.200	3.400	-0.38	MODERATE CHANGE
205	205992	BENZO(B)FLUORANTHENE	W	3.400	6.800	0.30	MODERATE CHANGE
206	191242	BENZO(GHI)PERYLENE	W	1.500	1.800	0.08	MODERATE CHANGE
207	207089	BENZO(K)FLUROANTHENE	W	3.400	6.800	0.30	MODERATE CHANGE
208	319857	BETA - BHC	W	0.066	0.066	0.00	UNCHANGED
209	111911	BIS(2-CHLOROETHOXY)METHANE	W	7.200	7.200	0.00	UNCHANGED
210	111444	BIS(2-CHLOROETHYL)ETHER	W	7.200	6.000	-0.08	MODERATE CHANGE
211	39638329	BIS(2-CHLOROISOPROPYL)ETHER	W	7.200	7.200	0.00	UNCHANGED
212	117817	BIS(2-ETHYLHEXYL)PHTHALATE	W	28.000	28.000	0.00	UNCHANGED
213	75274	BROMODICHLOROMETHANE	W	15.000	15.000	0.00	UNCHANGED
214	74839	BROMOMETHANE	W	15.000	15.000	0.00	UNCHANGED
215	85687	BUTYL BENZYL PHTHALATE	W	7.900	28.000	0.55	MODERATE CHANGE
216	56235	CARBON TETRACHLORIDE	W	5.600	6.000	0.03	MODERATE CHANGE
217	57749	CHLORDANE	W	0.130	0.260	0.30	MODERATE CHANGE
218	108907	CHLOROBENZENE	W	5.700	6.000	0.02	MODERATE CHANGE
219	124481	CHLORODIBROMOMETHANE	W	15.000	15.000	0.00	UNCHANGED
220	75003	CHLOROETHANE	W	6.000	6.000	0.00	UNCHANGED
221	67663	CHLOROFORM	W	5.600	6.000	0.03	MODERATE CHANGE
222	74873	CHLOROMETHANE	W	33.000	30.000	-0.04	MODERATE CHANGE
223	218019	CHRYSENE	W	8.200	3.400	-0.38	MODERATE CHANGE
224	10061026	CIS-1,3-DICHLOROPROPENE	W	18.000	18.000	0.00	UNCHANGED
225	1319773	CRESOLS	W	3.200	.	.	STANDARD PENDING
226	57125	CYANIDE (TOTAL)	W	1.800	590.000	2.52	SIGNIF. LESS STRINGENT
227	319866	DELTA - BHC	W	0.066	0.066	0.00	UNCHANGED
228	84742	DI-N-BUTYL PHTHALATE	W	28.000	28.000	0.00	UNCHANGED
229	117840	DI-N-OCTYL PHTHALATE	W	28.000	28.000	0.00	UNCHANGED
230	621647	DI-N-PROPYLNITROSAMINE	W	14.000	14.000	0.00	UNCHANGED
231	53703	DIBENZ(A,H)ANTHRACENE	W	8.200	8.200	0.00	UNCHANGED
[illegible]	74953	DIBROMOMETHANE	W	15.000	15.000	0.00	UNCHANGED
[illegible]	75718	DICHLORODIFLUOROMETHANE	W	7.200	7.200	0.00	UNCHANGED
[illegible]	60571	DIELDRIN	W	0.130	0.130	0.00	UNCHANGED
235	84662	DIETHYL PHTHALATE	W	28.000	28.000	0.00	UNCHANGED
236	131113	DIMETHYL PHTHALATE	W	28.000	28.000	0.00	UNCHANGED
237	298044	DISULFOTON	W	6.200	6.200	0.00	UNCHANGED
238	939988	ENDOSULFAN I	W	0.066	0.066	0.00	UNCHANGED
239	33213065	ENDOSULFAN II	W	0.130	0.130	0.00	UNCHANGED
240	1031078	ENDOSULFAN SULFATE	W	0.130	0.130	0.00	UNCHANGED
241	72208	ENDRIN	W	0.130	0.130	0.00	UNCHANGED
242	7421934	ENDRIN ALDEHYDE	W	0.130	0.130	0.00	UNCHANGED
243	141786	ETHYL ACETATE	W	33.000	33.000	0.00	UNCHANGED
244	100414	ETHYL BENZENE	W	6.000	10.000	0.22	MODERATE CHANGE
245	107120	ETHYL CYANIDE	W	360.000	360.000	0.00	UNCHANGED
246	60297	ETHYL ETHER	W	160.000	160.000	0.00	UNCHANGED
247	97632	ETHYL METHACRYLATE	W	160.000	160.000	0.00	UNCHANGED
248	52857	FAMPHUR	W	15.000	15.000	0.00	UNCHANGED
249	206440	FLUORANTHENE	W	8.200	3.400	-0.38	MODERATE CHANGE
250	86737	FLUORENE	W	4.000	3.400	-0.07	MODERATE CHANGE
251	58899	GAMMA-BHC (LINDANE)	W	0.066	0.066	0.00	UNCHANGED
252	76448	HEPTACHLOR	W	0.066	0.066	0.00	UNCHANGED
253	1024573	HEPTACHLOR EPOXIDE	W	0.066	0.066	0.00	UNCHANGED
254	118741	HEXACHLOROBENZENE	W	37.000	10.000	-0.57	MODERATE CHANGE
255	87683	HEXACHLOROBUTADIENE	W	28.000	5.600	-0.70	MODERATE CHANGE
256	77474	HEXACHLOROCYCLOPENTADIENE	W	3.600	2.400	-0.18	MODERATE CHANGE
257	99900004	HEXACHLORODIBENZO-P-DIOXINS	W	0.001	0.001	0.00	UNCHANGED
258	99900003	HEXACHLORODIBENZOFURANS	W	0.001	0.001	0.00	UNCHANGED
259	67721	HEXACHLOROETHANE	W	28.000	30.000	0.03	MODERATE CHANGE
260	1888717	HEXACHLOROPROPENE	W	28.000	30.000	0.03	MODERATE CHANGE
261	193395	INDENO(1,2,3-CD)PYRENE	W	8.200	3.400	-0.38	MODERATE CHANGE
262	74884	IODOMETHANE	W	65.000	65.000	0.00	UNCHANGED
263	78831	ISOBUTYL ALCOHOL	W	170.000	170.000	0.00	UNCHANGED
264	465736	ISODRIN	W	0.066	0.066	0.00	UNCHANGED
265	120581	ISOSAFROLE	W	2.600	2.600	0.00	UNCHANGED
266	143500	KEPONE	W	0.130	0.130	0.00	UNCHANGED
267	108394	M-CRESOL	W	3.200	5.600	0.24	MODERATE CHANGE
268	126987	METHACRYLONITRILE	W	84.000	84.000	0.00	UNCHANGED
269	91805	METHAPYRILENE	W	1.500	1.500	0.00	UNCHANGED
[illegible]	72435	METHOXYCHLOR	W	0.180	0.180	0.00	UNCHANGED
[illegible]	78933	METHYL ETHYL KETONE	W	36.000	36.000	0.00	UNCHANGED
[illegible]	108101	METHYL ISOBUTYL KETONE	W	33.000	33.000	0.00	UNCHANGED
273	80626	METHYL METHACRYLATE	W	160.000	160.000	0.00	UNCHANGED

APPENDIX B
ANALYSIS OF UTS IMPACTS
WASTESTREAMS WITH CHANGING TREATMENT STANDARDS

WST_CODE=F039
(continued)

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
274	298000	METHYL PARATHION	W	4.600	4.600	0.00	UNCHANGED
275	75092	METHYLENE CHLORIDE	W	33.000	30.000	-0.04	MODERATE CHANGE
276	71363	N-BUTYL ALCOHOL	W	2.600	2.600	0.00	UNCHANGED
277	924163	N-NITROSODI-N-BUTYLAMINE	W	17.000	17.000	0.00	UNCHANGED
278	55185	N-NITROSODIETHYLAMINE	W	28.000	28.000	0.00	UNCHANGED
279	10595956	N-NITROSOMETHYLETHYLAMINE	W	2.300	2.300	0.00	UNCHANGED
280	59982	N-NITROSOMORPHOLINE	W	2.300	2.300	0.00	UNCHANGED
281	100754	N-NITROSOPIPERIDINE	W	35.000	35.000	0.00	UNCHANGED
282	930552	N-NITROSOPYRROLIDINE	W	35.000	35.000	0.00	UNCHANGED
283	91203	NAPHTHALENE	W	3.100	5.600	0.26	MODERATE CHANGE
284	98953	NITROBENZENE	W	14.000	14.000	0.00	UNCHANGED
285	53190	O,P' - DDD	W	0.087	0.087	0.00	UNCHANGED
286	3424826	O,P' - DDE	W	0.087	0.087	0.00	UNCHANGED
287	789026	O,P' - DDT	W	0.087	0.087	0.00	UNCHANGED
288	95487	O-CRESOL (2-METHYLPHENOL)	W	5.600	5.600	0.00	UNCHANGED
289	72548	P,P' - DDD	W	0.087	0.087	0.00	UNCHANGED
290	72559	P,P' - DDE	W	0.087	0.087	0.00	UNCHANGED
291	50293	P,P' - DDT	W	0.087	0.087	0.00	UNCHANGED
292	59507	P-CHLORO-M-CRESOL	W	14.000	14.000	0.00	UNCHANGED
293	106478	P-CHLOROANILINE	W	16.000	16.000	0.00	UNCHANGED
294	106445	P-CRESOL	W	3.200	5.600	0.24	MODERATE CHANGE
295	100016	P-NITROANILINE	W	28.000	28.000	0.00	UNCHANGED
296	56382	PARATHION	W	4.600	4.600	0.00	UNCHANGED
297	99900006	PENTACHLORDIBENZO-P-DIOXINS	W	0.001	0.001	0.00	UNCHANGED
298	608935	PENTACHLOROBENZENE	W	37.000	10.000	-0.57	MODERATE CHANGE
299	99900007	PENTACHLORODIBENZOFURANS	W	0.001	0.001	0.00	UNCHANGED
300	82688	PENTACHLORONITROBENZENE	W	4.800	4.800	0.00	UNCHANGED
301	87865	PENTACHLOROPHENOL	W	7.400	7.400	0.00	UNCHANGED
302	62442	PHENACETIN	W	16.000	16.000	0.00	UNCHANGED
303	85018	PHENANTHRENE	W	3.100	5.600	0.26	MODERATE CHANGE
304	108952	PHENOL	W	6.200	6.200	0.00	UNCHANGED
305	298022	PHORATE	W	4.600	4.600	0.00	UNCHA[illegible]
306	23950585	PRONAMIDE	W	1.500	1.500	0.00	UNCH[illegible]
307	129000	PYRENE	W	8.200	8.200	0.00	UNCH[illegible]
308	110861	PYRIDINE	W	16.000	16.000	0.00	UNCHA[illegible]
309	94597	SAFROLE	W	22.000	22.000	0.00	UNCHANGED
310	93721	SILVEX (2,4,5-TP)	W	7.900	7.900	0.00	UNCHANGED
311	99900010	TETRACHLORODIBENZO-P-DIOXINS	W	0.001	0.001	0.00	UNCHANGED
312	99900009	TETRACHLORODIBENZOFURANS	W	0.001	0.001	0.00	UNCHANGED
313	127184	TETRACHLOROETHENE	W	5.600	6.000	0.03	MODERATE CHANGE
314	108883	TOLUENE	W	28.000	10.000	-0.45	MODERATE CHANGE
315	8001352	TOXAPHENE	W	1.300	2.600	0.30	MODERATE CHANGE
316	156605	TRANS-1,2-DICHLOROETHYLENE	W	33.000	30.000	-0.04	MODERATE CHANGE
317	10061015	TRANS-1,3-DICHLOROPROPENE	W	18.000	18.000	0.00	UNCHANGED
318	75252	TRIBROMOMETHANE	W	15.000	.	.	STANDARD PENDING
319	79016	TRICHLOROETHENE	W	5.600	6.000	0.03	MODERATE CHANGE
320	75694	TRICHLOROMONOFLUOROMETHANE	W	33.000	30.000	-0.04	MODERATE CHANGE
321	75014	VINYL CHLORIDE	W	33.000	6.000	-0.74	MODERATE CHANGE
322	1330207	XYLENES (TOTAL)	W	28.000	30.000	0.03	MODERATE CHANGE

WST_CODE=K001

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
323	7439921	LEAD	E	0.510	0.370	-0.14	MODERATE CHANGE
324	91203	NAPHTHALENE	W	1.500	5.600	0.57	MODERATE CHANGE
325	87865	PENTACHLOROPHENOL	W	7.400	7.400	0.00	UNCHANGED
326	85018	PHENANTHRENE	W	1.500	5.600	0.57	MODERATE CHANGE
327	129000	PYRENE	W	1.500	8.200	0.74	MODERATE CHANGE
328	108883	TOLUENE	W	28.000	10.000	-0.45	MODERATE CHANGE
329	1330207	XYLENES (TOTAL)	W	33.000	30.000	-0.04	MODERATE CHANGE

WST_CODE=K002

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
330	7440473	CHROMIUM (TOTAL)	E	0.094	0.330	0.55	MOD[illegible] CHANGE
331	7439921	LEAD	E	0.370	0.370	0.00	UNC[illegible]

APPENDIX B
ANALYSIS OF UTS IMPACTS
WASTESTREAMS WITH CHANGING TREATMENT STANDARDS

WST_CODE=K003

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
332	7440473	CHROMIUM (TOTAL)	E	0.094	0.330	0.55	MODERATE CHANGE
333	7439921	LEAD	E	0.370	0.370	0.00	UNCHANGED

WST_CODE=K004

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
334	7440473	CHROMIUM (TOTAL)	E	0.094	0.330	0.55	MODERATE CHANGE
335	7439921	LEAD	E	0.370	0.370	0.00	UNCHANGED

WST_CODE=K006 (ANHYDROUS)

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
336	7440473	CHROMIUM (TOTAL)	E	0.094	0.330	0.55	MODERATE CHANGE
337	7439921	LEAD	E	0.370	0.370	0.00	UNCHANGED

WST_CODE=K006 (HYDRATED)

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
338	7440473	CHROMIUM (TOTAL)	E	5.200	0.330	-1.20	MODERATE CHANGE

WST_CODE=K007

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
339	7440473	CHROMIUM (TOTAL)	E	0.094	0.330	0.55	MODERATE CHANGE
340	7439921	LEAD	E	0.370	0.370	0.00	UNCHANGED

WST_CODE=K008

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
341	7440473	CHROMIUM (TOTAL)	E	0.094	0.330	0.55	MODERATE CHANGE
342	7439921	LEAD	E	0.370	0.370	0.00	UNCHANGED

WST_CODE=K011

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
343	75058	ACETONITRILE	W	1.800	.	.	STANDARD PENDING
344	79061	ACRYLAMIDE	W	23.000	.	.	STANDARD PENDING
345	107131	ACRYLONITRILE	W	1.400	84.000	1.78	SIGNIF. LESS STRINGENT
346	71432	BENZENE	W	0.030	10.000	2.52	SIGNIF. LESS STRINGENT
347	57125	CYANIDE (AMENABLE)	W	57.000	30.000	-0.28	MODERATE CHANGE

WST_CODE=K013

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
348	75058	ACETONITRILE	W	1.800	.	.	STANDARD PENDING
349	79061	ACRYLAMIDE	W	23.000	.	.	STANDARD PENDING
350	107131	ACRYLONITRILE	W	1.400	84.000	1.78	SIGNIF. LESS STRINGENT
351	71432	BENZENE	W	0.030	10.000	2.52	SIGNIF. LESS STRINGENT
352	57125	CYANIDE (AMENABLE)	W	57.000	30.000	-0.28	MODERATE CHANGE

APPENDIX B
ANALYSIS OF UTS IMPACTS
WASTESTREAMS WITH CHANGING TREATMENT STANDARDS

WST_CODE=K014

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
353	75058	ACETONITRILE	W	1.800	.	.	STANDARD PENDING
354	79061	ACRYLAMIDE	W	23.000	.	.	STANDARD PENDING
355	107131	ACRYLONITRILE	W	1.400	84.000	1.78	SIGNIF. LESS STRIN
356	71432	BENZENE	W	0.030	10.000	2.52	SIGNIF. LESS STRIN
357	57125	CYANIDE (AMENABLE)	W	57.000	30.000	-0.28	MODERATE CHANGE

WST_CODE=K015

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
358	7440473	CHROMIUM (TOTAL)	E	1.700	0.330	-0.71	MODERATE CHANGE
359	7440020	NICKEL	E	0.200	5.000	1.40	SIGNIF. LESS STRIN
360	120127	ANTHRACENE	W	3.400	3.400	0.00	UNCHANGED
361	98873	BENZAL CHLORIDE	W	6.200	6.000	-0.01	MODERATE CHANGE
362	85018	PHENANTHRENE	W	3.400	5.600	0.22	MODERATE CHANGE
363	99900012	SUM OF BENZO(B)FLUORANTHENE	W	3.400	.	.	STANDARD PENDING
364	108883	TOLUENE	W	6.000	10.000	0.22	MODERATE CHANGE

WST_CODE=K016

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
365	118741	HEXACHLOROBENZENE	W	28.000	10.000	-0.45	MODERATE CHANG
366	87683	HEXACHLOROBUTADIENE	W	5.600	5.600	0.00	UNCHANGED
367	77474	HEXACHLOROCYCLOPENTADIENE	W	5.600	2.400	-0.37	MODERATE CHANG
368	67721	HEXACHLOROETHANE	W	28.000	30.000	0.03	MODERATE CHANG
369	127184	TETRACHLOROETHENE	W	6.000	6.000	0.00	UNCHANGED

WST_CODE=K017

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
370	96184	1,2,3-TRICHLOROPROPANE	W	28.000	30.000	0.03	MODERATE CHANG
371	78875	1,2-DICHLOROPROPANE	W	18.000	18.000	0.00	UNCHANGED
372	111444	BIS(2-CHLOROETHYL)ETHER	W	7.200	6.000	-0.08	MODERATE CHANG

WST_CODE=K018

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
373	71556	1,1,1-TRICHLOROETHANE	W	6.000	6.000	0.00	UNCHANGED
374	75343	1,1-DICHLOROETHANE	W	6.000	6.000	0.00	UNCHANGED
375	107062	1,2-DICHLOROETHANE	W	6.000	6.000	0.00	UNCHANGED
376	75003	CHLOROETHANE	W	6.000	6.000	0.00	UNCHANGED
377	118741	HEXACHLOROBENZENE	W	28.000	10.000	-0.45	MODERATE CHANG
378	87683	HEXACHLOROBUTADIENE	W	5.600	5.600	0.00	UNCHANGED
379	67721	HEXACHLOROETHANE	W	28.000	30.000	0.03	MODERATE CHANG
380	76017	PENTACHLOROETHANE	W	5.600	6.000	0.03	MODERATE CHANG

WST_CODE=K019

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
381	71556	1,1,1-TRICHLOROETHANE	W	6.000	6.000	0.00	UNCHANGED
382	120821	1,2,4-TRICHLOROBENZENE	W	19.000	19.000	0.00	UNCHANGED
383	107062	1,2-DICHLOROETHANE	W	6.000	6.000	0.00	UNCHANGED
384	111444	BIS(2-CHLOROETHYL)ETHER	W	5.600	6.000	0.03	MODERATE CHANG
385	108907	CHLOROBENZENE	W	6.000	6.000	0.00	UNCHANGED
386	67663	CHLOROFORM	W	6.000	6.000	0.00	UNCHANGED
387	67721	HEXACHLOROETHANE	W	28.000	30.000	0.03	MODERATE CHANG
388	91203	NAPHTHALENE	W	5.600	5.600	0.00	UNCHANGED
389	85018	PHENANTHRENE	W	5.600	5.600	0.00	UNCHANGED
390	127184	TETRACHLOROETHENE	W	6.000	6.000	0.00	UNCHANGED

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WST_CODE=K020

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
391	79345	1,1,2,2-TETRACHLOROETHANE	W	5.600	6.000	0.03	MODERATE CHANGE
392	107062	1,2-DICHLOROETHANE	W	6.000	6.000	0.00	UNCHANGED
393	127184	TETRACHLOROETHENE	W	6.000	6.000	0.00	UNCHANGED

WST_CODE=K021

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
394	7440360	ANTIMONY	E	0.230	2.100	0.96	MODERATE CHANGE
395	56235	CARBON TETRACHLORIDE	W	6.200	6.000	-0.01	MODERATE CHANGE
396	67663	CHLOROFORM	W	6.200	6.000	-0.01	MODERATE CHANGE

WST_CODE=K022

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
397	7440473	CHROMIUM (TOTAL)	E	5.200	0.330	-1.20	MODERATE CHANGE
398	7440020	NICKEL	E	0.320	5.000	1.19	MODERATE CHANGE
399	98862	ACETOPHENONE	W	19.000	9.700	-0.29	MODERATE CHANGE
400	108952	PHENOL	W	12.000	6.200	-0.29	MODERATE CHANGE
401	99900013	SUM OF DIPHENYLAMINE AND DIP	W	13.000	.	.	STANDARD PENDING
402	108883	TOLUENE	W	0.034	10.000	2.47	SIGNIF. LESS STRINGENT

WST_CODE=K028

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
[illegible]	7440473	CHROMIUM (TOTAL)	E	0.073	0.330	0.66	MODERATE CHANGE
[illegible]	7439921	LEAD	E	0.021	0.370	1.25	MODERATE CHANGE
[illegible]	7440020	NICKEL	E	0.088	5.000	1.75	SIGNIF. LESS STRINGENT
406	630206	1,1,1,2-TETRACHLOROETHANE	W	5.600	6.000	0.03	MODERATE CHANGE
407	71556	1,1,1-TRICHLOROETHANE	W	6.000	6.000	0.00	UNCHANGED
408	79345	1,1,2,2-TETRACHLOROETHANE	W	5.600	6.000	0.03	MODERATE CHANGE
409	79005	1,1,2-TRICHLOROETHANE	W	6.000	6.000	0.00	UNCHANGED
410	75343	1,1-DICHLOROETHANE	W	6.000	6.000	0.00	UNCHANGED
411	87683	HEXACHLOROBUTADIENE	W	5.600	5.600	0.00	UNCHANGED
412	67721	HEXACHLOROETHANE	W	28.000	30.000	0.03	MODERATE CHANGE
413	76017	PENTACHLOROETHANE	W	5.600	6.000	0.03	MODERATE CHANGE
414	127184	TETRACHLOROETHENE	W	6.000	6.000	0.00	UNCHANGED

WST_CODE=K030

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
415	95943	1,2,4,5-TETRACHLOROBENZENE	W	14.000	14.000	0.00	UNCHANGED
416	120821	1,2,4-TRICHLOROBENZENE	W	19.000	19.000	0.00	UNCHANGED
417	87683	HEXACHLOROBUTADIENE	W	5.600	5.600	0.00	UNCHANGED
418	67721	HEXACHLOROETHANE	W	28.000	30.000	0.03	MODERATE CHANGE
419	1888717	HEXACHLOROPROPENE	W	19.000	30.000	0.20	MODERATE CHANGE
420	608935	PENTACHLOROBENZENE	W	28.000	10.000	-0.45	MODERATE CHANGE
421	76017	PENTACHLOROETHANE	W	5.600	6.000	0.03	MODERATE CHANGE
422	127184	TETRACHLOROETHENE	W	6.000	6.000	0.00	UNCHANGED

WST_CODE=K031

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
423	7440382	ARSENIC	E	5.600	5.000	-0.05	MODERATE CHANGE

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WST_CODE=K035

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
424	83329	ACENAPHTHENE	W	3.400	3.400	0.00	UNCHANGED
425	120127	ANTHRACENE	W	3.400	3.400	0.00	UNCHANGED
426	56553	BENZ(A)ANTHRACENE	W	3.400	3.400	0.00	UNCHANGED
427	50328	BENZO(A)PYRENE	W	3.400	3.400	0.00	UNCHANGED
428	218019	CHRYSENE	W	3.400	3.400	0.00	UNCHANGED
429	53703	DIBENZ(A,H)ANTHRACENE	W	3.400	8.200	0.38	MODERATE CHAN
430	206440	FLUORANTHENE	W	3.400	3.400	0.00	UNCHANGED
431	86737	FLUORENE	W	3.400	3.400	0.00	UNCHANGED
432	193395	INDENO(1,2,3-CD)PYRENE	W	3.400	3.400	0.00	UNCHANGED
433	91203	NAPHTHALENE	W	3.400	5.600	0.22	MODERATE CHAN
434	85018	PHENANTHRENE	W	3.400	5.600	0.22	MODERATE CHAN
435	129000	PYRENE	W	8.200	8.200	0.00	UNCHANGED

WST_CODE=K036

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
436	298044	DISULFOTON	W	0.100	6.200	1.79	SIGNIF. LESS STRI

WST_CODE=K037

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
437	298044	DISULFOTON	W	0.100	6.200	1.79	SIGNIF. LESS STRI
438	108883	TOLUENE	W	28.000	10.000	-0.45	MODERATE CHANGE

WST_CODE=K038

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
439	298022	PHORATE	W	0.100	4.600	1.66	SIGNIF. LESS STRI

WST_CODE=K040

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
440	298022	PHORATE	W	0.100	4.600	1.66	SIGNIF. LESS STRI

WST_CODE=K042

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
441	95501	(O)1,2-DICHLOROBENZENE	W	4.400	6.000	0.13	MODERATE CHAN
442	106467	(P)1,4-DICHLOROBENZENE	W	4.400	6.000	0.13	MODERATE CHAN
443	95943	1,2,4,5-TETRACHLOROBENZENE	W	4.400	14.000	0.50	MODERATE CHAN
444	120821	1,2,4-TRICHLOROBENZENE	W	4.400	19.000	0.64	MODERATE CHAN
445	608935	PENTACHLOROBENZENE	W	4.400	10.000	0.36	MODERATE CHAN

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WST_CODE=K043

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
446	95954	2,4,5-TRICHLOROPHENOL	W	8.200	7.400	-0.04	MODERATE CHANGE
447	88062	2,4,6-TRICHLOROPHENOL	W	7.600	7.400	-0.01	MODERATE CHANGE
448	120832	2,4-DICHLOROPHENOL	W	0.380	14.000	1.57	SIGNIF. LESS STRINGENT
449	87650	2,6-DICHLOROPHENOL	W	0.340	14.000	1.61	SIGNIF. LESS STRINGENT
450	99900004	HEXACHLORODIBENZO-P-DIOXINS	W	0.001	0.001	0.00	UNCHANGED
451	99900003	HEXACHLORODIBENZOFURANS	W	0.001	0.001	0.00	UNCHANGED
452	99900006	PENTACHLORDIBENZO-P-DIOXINS	W	0.001	0.001	0.00	UNCHANGED
453	99900007	PENTACHLORODIBENZOFURANS	W	0.001	0.001	0.00	UNCHANGED
454	87865	PENTACHLOROPHENOL	W	1.900	7.400	0.59	MODERATE CHANGE
455	99900010	TETRACHLORODIBENZO-P-DIOXINS	W	0.001	0.001	0.00	UNCHANGED
456	99900009	TETRACHLORODIBENZOFURANS	W	0.001	0.001	0.00	UNCHANGED
457	127184	TETRACHLOROETHENE	W	1.700	6.000	0.55	MODERATE CHANGE
458	99900011	TETRACHLOROPHENOLS-TOTAL	W	0.680	.	.	STANDARD PENDING

WST_CODE=K046

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
459	7439921	LEAD	E	0.180	0.370	0.31	MODERATE CHANGE

WST_CODE=K048

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
460	7440473	CHROMIUM (TOTAL)	E	1.700	.	.	STANDARD PENDING
461	7440020	NICKEL	E	0.200	5.000	1.40	SIGNIF. LESS STRINGENT
462	71432	BENZENE	W	14.000	10.000	-0.15	MODERATE CHANGE
463	50328	BENZO(A)PYRENE	W	12.000	3.400	-0.55	MODERATE CHANGE
[illegible]	117817	BIS(2-ETHYLHEXYL)PHTHALATE	W	7.300	28.000	0.58	MODERATE CHANGE
[illegible]	218019	CHRYSENE	W	15.000	3.400	-0.64	MODERATE CHANGE
[illegible]	57125	CYANIDE (TOTAL)	W	1.800	590.000	2.52	SIGNIF. LESS STRINGENT
[illegible]	84742	DI-N-BUTYL PHTHALATE	W	3.600	28.000	0.89	MODERATE CHANGE
468	100414	ETHYL BENZENE	W	14.000	10.000	-0.15	MODERATE CHANGE
469	91203	NAPHTHALENE	W	42.000	5.600	-0.88	MODERATE CHANGE
470	85018	PHENANTHRENE	W	34.000	5.600	-0.78	MODERATE CHANGE
471	108952	PHENOL	W	3.600	6.200	0.24	MODERATE CHANGE
472	129000	PYRENE	W	36.000	8.200	-0.64	MODERATE CHANGE
473	108883	TOLUENE	W	14.000	10.000	-0.15	MODERATE CHANGE
474	1330207	XYLENES (TOTAL)	W	22.000	30.000	0.13	MODERATE CHANGE

WST_CODE=K049

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
475	7440473	CHROMIUM (TOTAL)	E	1.700	.	.	STANDARD PENDING
476	7440020	NICKEL	E	0.200	5.000	1.40	SIGNIF. LESS STRINGENT
477	120127	ANTHRACENE	W	28.000	3.400	-0.92	MODERATE CHANGE
478	71432	BENZENE	W	14.000	10.000	-0.15	MODERATE CHANGE
479	50328	BENZO(A)PYRENE	W	12.000	3.400	-0.55	MODERATE CHANGE
480	117817	BIS(2-ETHYLHEXYL)PHTHALATE	W	7.300	28.000	0.58	MODERATE CHANGE
481	218019	CHRYSENE	W	15.000	3.400	-0.64	MODERATE CHANGE
482	57125	CYANIDE (TOTAL)	W	1.800	590.000	2.52	SIGNIF. LESS STRINGENT
483	100414	ETHYL BENZENE	W	14.000	10.000	-0.15	MODERATE CHANGE
484	91203	NAPHTHALENE	W	42.000	5.600	-0.88	MODERATE CHANGE
485	85018	PHENANTHRENE	W	34.000	5.600	-0.78	MODERATE CHANGE
486	108952	PHENOL	W	3.600	6.200	0.24	MODERATE CHANGE
487	129000	PYRENE	W	36.000	8.200	-0.64	MODERATE CHANGE
488	108883	TOLUENE	W	14.000	10.000	-0.15	MODERATE CHANGE
489	1330207	XYLENES (TOTAL)	W	22.000	30.000	0.13	MODERATE CHANGE

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WST_CODE=K050

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
490	7440473	CHROMIUM (TOTAL)	E	1.700	.	.	STANDARD PENDING
491	7440020	NICKEL	E	0.200	5.000	1.40	SIGNIF. LESS STRIN
492	50328	BENZO(A)PYRENE	W	12.000	3.400	-0.55	MODERATE CHANGE
493	57125	CYANIDE (TOTAL)	W	1.800	590.000	2.52	SIGNIF. LESS STRIN
494	108952	PHENOL	W	3.600	6.200	0.24	MODERATE CHANGE

WST_CODE=K051

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
495	7440473	CHROMIUM (TOTAL)	E	1.700	.	.	STANDARD PENDING
496	7440020	NICKEL	E	0.200	5.000	1.40	SIGNIF. LESS STRIN
497	120127	ANTHRACENE	W	28.000	3.400	-0.92	MODERATE CHANGE
498	56553	BENZ(A)ANTHRACENE	W	20.000	3.400	-0.77	MODERATE CHANGE
499	71432	BENZENE	W	14.000	10.000	-0.15	MODERATE CHANGE
500	50328	BENZO(A)PYRENE	W	12.000	3.400	-0.55	MODERATE CHANGE
501	117817	BIS(2-ETHYLHEXYL)PHTHALATE	W	7.300	28.000	0.58	MODERATE CHANGE
502	218019	CHRYSENE	W	15.000	3.400	-0.64	MODERATE CHANGE
503	57125	CYANIDE (TOTAL)	W	1.800	590.000	2.52	SIGNIF. LESS STRIN
504	84742	DI-N-BUTYL PHTHALATE	W	3.600	28.000	0.89	MODERATE CHANGE
505	100414	ETHYL BENZENE	W	14.000	10.000	-0.15	MODERATE CHANGE
506	91203	NAPHTHALENE	W	42.000	5.600	-0.88	MODERATE CHANGE
507	85018	PHENANTHRENE	W	34.000	5.600	-0.78	MODERATE CHANGE
508	108952	PHENOL	W	3.600	6.200	0.24	MODERATE CHANGE
509	129000	PYRENE	W	36.000	8.200	-0.64	MODERATE CHANGE
510	108883	TOLUENE	W	14.000	10.000	-0.15	MODERATE CHANGE
511	1330207	XYLENES (TOTAL)	W	22.000	30.000	0.13	MODERATE CHANGE

WST_CODE=K052

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
512	7440473	CHROMIUM (TOTAL)	E	1.700	.	.	STANDARD PENDING
513	7440020	NICKEL	E	0.200	5.000	1.40	SIGNIF. LESS STRIN
514	57125	CYANIDE (TOTAL)	W	1.800	590.000	2.52	SIGNIF. LESS STRIN
515	100414	ETHYL BENZENE	W	14.000	10.000	-0.15	MODERATE CHANGE
516	91203	NAPHTHALENE	W	42.000	5.600	-0.88	MODERATE CHANGE
517	95487	O-CRESOL (2-METHYLPHENOL)	W	6.200	5.600	-0.04	MODERATE CHANGE
518	106445	P-CRESOL	W	6.200	5.600	-0.04	MODERATE CHANGE
519	85018	PHENANTHRENE	W	34.000	5.600	-0.78	MODERATE CHANGE
520	108952	PHENOL	W	3.600	6.200	0.24	MODERATE CHANGE
521	108883	TOLUENE	W	14.000	10.000	-0.15	MODERATE CHANGE
522	1330207	XYLENES (TOTAL)	W	22.000	30.000	0.13	MODERATE CHANGE

WST_CODE=K060

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
523	71432	BENZENE	W	0.071	10.000	2.15	SIGNIF. LESS STRIN
524	50328	BENZO(A)PYRENE	W	3.600	3.400	-0.02	MODERATE CHANGE
525	57125	CYANIDE (TOTAL)	W	1.200	590.000	2.69	SIGNIF. LESS STRIN
526	91203	NAPHTHALENE	W	3.400	5.600	0.22	MODERATE CHANGE
527	108952	PHENOL	W	3.400	6.200	0.26	MODERATE CHANGE

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WST_CODE=K061

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
528	7440360	ANTIMONY	E	2.100	2.100	0.00	UNCHANGED
529	7440382	ARSENIC	E	0.055	5.000	1.96	SIGNIF. LESS STRINGENT
530	7440393	BARIUM	E	7.600	7.600	0.00	UNCHANGED
531	7440417	BERYLLIUM	E	0.014	0.014	0.00	UNCHANGED
532	7440439	CADMIUM	E	0.190	0.190	0.00	UNCHANGED
533	7440473	CHROMIUM (TOTAL)	E	0.330	0.330	0.00	UNCHANGED
534	7439921	LEAD	E	0.370	0.370	0.00	UNCHANGED
535	7439976	MERCURY	E	0.009	0.009	0.00	UNCHANGED
536	7440020	NICKEL	E	5.000	5.000	0.00	UNCHANGED
537	7782492	SELENIUM	E	0.160	0.160	0.00	UNCHANGED
538	7440224	SILVER	E	0.300	0.300	0.00	UNCHANGED
539	7440280	THALLIUM	E	0.078	0.078	0.00	UNCHANGED
540	7440666	ZINC	E	5.300	5.300	0.00	UNCHANGED

WST_CODE=K069

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
541	7440439	CADMIUM	E	0.140	0.190	0.13	MODERATE CHANGE
542	7439921	LEAD	E	0.240	0.370	0.19	MODERATE CHANGE

WST_CODE=K071

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDAR	UTS TO BDAT RATIO (LOG)	REMARK
543	7439976	MERCURY	E	0.025	0.009	-0.44	MODERATE CHANGE

WST_CODE=K073

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
544	71556	1,1,1-TRICHLOROETHANE	W	6.200	6.000	-0.01	MODERATE CHANGE
545	56235	CARBON TETRACHLORIDE	W	6.200	6.000	-0.01	MODERATE CHANGE
546	67663	CHLOROFORM	W	6.200	6.000	-0.01	MODERATE CHANGE
547	67721	HEXACHLOROETHANE	W	30.000	30.000	0.00	UNCHANGED
548	127184	TETRACHLOROETHENE	W	6.200	6.000	-0.01	MODERATE CHANGE

WST_CODE=K083

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
549	7440020	NICKEL	E	0.088	5.000	1.75	SIGNIF. LESS STRINGENT
550	62533	ANILINE	W	14.000	14.000	0.00	UNCHANGED
551	71432	BENZENE	W	6.600	10.000	0.18	MODERATE CHANGE
552	98953	NITROBENZENE	W	14.000	14.000	0.00	UNCHANGED
553	108952	PHENOL	W	5.600	6.200	0.04	MODERATE CHANGE
554	99900013	SUM OF DIPHENYLAMINE AND DIP	W	14.000	.	.	STANDARD PENDING

WST_CODE=K084

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDAI	UTS TO BDAT RATIO (LOG)	REMARK
555	7440382	ARSENIC	E	5.600	5.000	-0.05	MODERATE CHANGE

APPENDIX B
ANALYSIS OF UTS IMPACTS
WASTESTREAMS WITH CHANGING TREATMENT STANDARDS

WST_CODE=K085

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
556	11096825		W	1.800	.	.	STANDARD PENDING
557	11097691		W	1.800	.	.	STANDARD PENDING
558	11104282		W	0.920	.	.	STANDARD PENDING
559	11141165		W	0.920	.	.	STANDARD PENDING
560	12672296		W	0.920	.	.	STANDARD PENDING
561	12674112		W	0.920	.	.	STANDARD PENDING
562	53469219		W	0.920	.	.	STANDARD PENDING
563	541731	(M)1,3-DICHLOROBENZENE	W	4.400	6.000	0.13	MODERATE CHANGE
564	95501	(O)1,2-DICHLOROBENZENE	W	4.400	6.000	0.13	MODERATE CHANGE
565	106467	(P)1,4-DICHLOROBENZENE	W	4.400	6.000	0.13	MODERATE CHANGE
566	95943	1,2,4,5-TETRACHLOROBENZENE	W	4.400	14.000	0.50	MODERATE CHANGE
567	120821	1,2,4-TRICHLOROBENZENE	W	4.400	19.000	0.64	MODERATE CHANGE
568	71432	BENZENE	W	4.400	10.000	0.36	MODERATE CHANGE
569	108907	CHLOROBENZENE	W	4.400	6.000	0.13	MODERATE CHANGE
570	118741	HEXACHLOROBENZENE	W	4.400	10.000	0.36	MODERATE CHANGE
571	608935	PENTACHLOROBENZENE	W	4.400	10.000	0.36	MODERATE CHANGE

WST_CODE=K086

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
572	7440473	CHROMIUM (TOTAL)	E	0.094	0.330	0.55	MODERATE CHANGE
573	7439921	LEAD	E	0.370	0.370	0.00	UNCHANGED
574	95501	(O)1,2-DICHLOROBENZENE	W	6.200	6.000	-0.01	MODERATE CHANGE
575	71556	1,1,1-TRICHLOROETHANE	W	5.600	6.000	0.03	MODERATE CHANGE
576	67641	ACETONE	W	160.000	160.000	0.00	UNCHANGED
577	98862	ACETOPHENONE	W	9.700	9.700	0.00	UNCHANGED
578	117817	BIS(2-ETHYLHEXYL)PHTHALATE	W	28.000	28.000	0.00	UNCHANGED
579	85687	BUTYL BENZYL PHTHALATE	W	7.900	28.000	0.55	MODERATE CHANGE
580	84742	DI-N-BUTYL PHTHALATE	W	28.000	28.000	0.00	UNCHANGED
581	117840	DI-N-OCTYL PHTHALATE	W	28.000	28.000	0.00	UNCHANGED
582	84662	DIETHYL PHTHALATE	W	28.000	28.000	0.00	UNCH[illegible]
583	131113	DIMETHYL PHTHALATE	W	28.000	28.000	0.00	UNC[illegible]
584	141786	ETHYL ACETATE	W	33.000	33.000	0.00	UNC[illegible]
585	100414	ETHYL BENZENE	W	6.000	10.000	0.22	MODE[illegible] CHANGE
586	78933	METHYL ETHYL KETONE	W	36.000	36.000	0.00	UNCHANGED
587	108101	METHYL ISOBUTYL KETONE	W	33.000	33.000	0.00	UNCHANGED
588	75092	METHYLENE CHLORIDE	W	33.000	30.000	-0.04	MODERATE CHANGE
589	71363	N-BUTYL ALCOHOL	W	2.600	2.6[illegible]	0.00	UNCHANGED
590	91203	NAPHTHALENE	W	3.100	5.600	0.26	MODERATE CHANGE
591	98953	NITROBENZENE	W	14.000	14.000	0.00	UNCHANGED
592	108883	TOLUENE	W	28.000	10.000	-0.45	MODERATE CHANGE

WST_CODE=K087

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
593	7439921	LEAD	E	0.510	0.370	-0.14	MODERATE CHANGE
594	208968	ACENAPHTHALENE	W	3.400	3.400	0.00	UNCHANGED
595	71432	BENZENE	W	0.071	10.000	2.15	SIGNIF. LESS STRING
596	218019	CHRYSENE	W	3.400	3.400	0.00	UNCHANGED
597	206440	FLUORANTHENE	W	3.400	3.400	0.00	UNCHANGED
598	193395	INDENO(1,2,3-CD)PYRENE	W	3.400	3.400	0.00	UNCHANGED
599	91203	NAPHTHALENE	W	3.400	5.600	0.22	MODERATE CHANGE
600	85018	PHENANTHRENE	W	3.400	5.600	0.22	MODERATE CHANGE
601	108883	TOLUENE	W	0.650	10.000	1.19	MODERATE CHANGE
602	1330207	XYLENES (TOTAL)	W	0.070	30.000	2.63	SIGNIF. LESS STRING

WST_CODE=K095

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
603	630206	1,1,1,2-TETRACHLOROETHANE	W	5.600	6.000	0.03	MODERATE CHANGE
604	79345	1,1,2,2-TETRACHLOROETHANE	W	5.600	6.000	0.03	MODERATE CHANGE
605	79005	1,1,2-TRICHLOROETHANE	W	6.000	6.000	0.00	UNCHANGED
606	67721	HEXACHLOROETHANE	W	28.000	30.000	0.03	MODE[illegible] CHANGE
607	76017	PENTACHLOROETHANE	W	5.600	6.000	0.03	MOD[illegible] CHANGE
608	127184	TETRACHLOROETHENE	W	6.000	6.000	0.00	UNC[illegible]
609	79016	TRICHLOROETHENE	W	5.600	6.000	0.03	MODE[illegible] CHANGE

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ANALYSIS OF UTS IMPACTS
WASTESTREAMS WITH CHANGING TREATMENT STANDARDS

WST_CODE=K096

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
610	541731	(M)1,3-DICHLOROBENZENE	W	5.600	6.000	0.03	MODERATE CHANGE
611	630206	1,1,1,2-TETRACHLOROETHANE	W	5.600	6.000	0.03	MODERATE CHANGE
612	79345	1,1,2,2-TETRACHLOROETHANE	W	5.600	6.000	0.03	MODERATE CHANGE
613	79005	1,1,2-TRICHLOROETHANE	W	6.000	6.000	0.00	UNCHANGED
614	120821	1,2,4-TRICHLOROBENZENE	W	19.000	19.000	0.00	UNCHANGED
615	76017	PENTACHLOROETHANE	W	5.600	6.000	0.03	MODERATE CHANGE
616	127184	TETRACHLOROETHENE	W	6.000	6.000	0.00	UNCHANGED
617	79016	TRICHLOROETHENE	W	5.600	6.000	0.03	MODERATE CHANGE

WST_CODE=K099

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
618	94757	2,4- (D) DICHLOROPHENOXY ACE	W	1.000	10.000	1.00	MODERATE CHANGE
619	99900004	HEXACHLORODIBENZO-P-DIOXINS	W	0.001	0.001	0.00	UNCHANGED
620	99900004	HEXACHLORODIBENZO-P-DIOXINS	W	0.001	0.001	0.00	UNCHANGED
621	99900006	PENTACHLORDIBENZO-P-DIOXINS	W	0.001	0.001	0.00	UNCHANGED
622	99900007	PENTACHLORODIBENZOFURANS	W	0.001	0.001	0.00	UNCHANGED
623	99900010	TETRACHLORODIBENZO-P-DIOXINS	W	0.001	0.001	0.00	UNCHANGED
624	99900009	TETRACHLORODIBENZOFURANS	W	0.001	0.001	0.00	UNCHANGED

WST_CODE=K100

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
625	7440439	CADMIUM	E	0.066	0.190	0.46	MODERATE CHANGE
626	7440473	CHROMIUM (TOTAL)	E	5.200	0.330	-1.20	MODERATE CHANGE
627	7439921	LEAD	E	0.510	0.370	-0.14	MODERATE CHANGE

WST_CODE=K101

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
628	7440382	ARSENIC	E	5.600	5.000	-0.05	MODERATE CHANGE
629	99900014	O-NITROANILINE	W	14.000	14.000	0.00	UNCHANGED

WST_CODE=K102

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
630	7440382	ARSENIC	E	5.600	5.000	-0.05	MODERATE CHANGE
631	99900015	O-NITROPHENOL	W	13.000	13.000	0.00	UNCHANGED

WST_CODE=K103

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
632	51285	2,4-DINITROPHENOL	W	5.600	160.000	1.46	SIGNIF. LESS STRINGENT
633	62533	ANILINE	W	5.600	14.000	0.40	MODERATE CHANGE
634	71432	BENZENE	W	6.000	10.000	0.22	MODERATE CHANGE
635	98953	NITROBENZENE	W	5.600	14.000	0.40	MODERATE CHANGE
636	108952	PHENOL	W	5.600	6.200	0.04	MODERATE CHANGE

WST_CODE=K104

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
637	51285	2,4-DINITROPHENOL	W	5.600	160.000	1.46	SIGNIF. LESS STRINGENT
638	62533	ANILINE	W	5.600	14.000	0.40	MODERATE CHANGE
639	71432	BENZENE	W	6.000	10.000	0.22	MODERATE CHANGE
640	57125	CYANIDE (TOTAL)	W	1.800	590.000	2.52	SIGNIF. LESS STRINGENT
641	98953	NITROBENZENE	W	5.600	14.000	0.40	MODERATE CHANGE
642	108952	PHENOL	W	5.600	6.200	0.04	MODERATE CHANGE

APPENDIX B
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WASTESTREAMS WITH CHANGING TREATMENT STANDARDS

WST_CODE=K105

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
643	95501	(O)1,2-DICHLOROBENZENE	W	4.400	6.000	0.13	MODERATE CHANG
644	106467	(P)1,4-DICHLOROBENZENE	W	4.400	6.000	0.13	MODERATE CHANG
645	95954	2,4,5-TRICHLOROPHENOL	W	4.400	7.400	0.23	MODERATE CHANG
646	88062	2,4,6-TRICHLOROPHENOL	W	4.400	7.400	0.23	MODERATE CHANG
647	95578	2-CHLOROPHENOL	W	4.400	5.700	0.11	MODERATE CHANG
648	71432	BENZENE	W	4.400	10.000	0.36	MODERATE CHANG
649	108907	CHLOROBENZENE	W	4.400	6.000	0.13	MODERATE CHANG
650	108952	PHENOL	W	4.400	6.200	0.15	MODERATE CHANG

WST_CODE=K106 (NOT RESIDUES)

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
651	7439976	MERCURY	E	0.025	0.009	-0.44	MODERATE CHANG

WST_CODE=K106 (RESIDUES)

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
652	7439976	MERCURY	E	0.020	0.009	-0.35	MODERATE CHANG

WST_CODE=K115

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
653	7440020	NICKEL	E	0.320	5.000	1.19	MODERATE CHANG

WST_CODE=K117

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
654	106934	1,2-DIBROMOETHANE	W	15.000	15.000	0.00	UNCHANGED
655	74839	BROMOMETHANE	W	15.000	15.000	0.00	UNCHANGED
656	67663	CHLOROFORM	W	5.600	6.000	0.03	MODERATE CHANG

WST_CODE=K118

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
657	106934	1,2-DIBROMOETHANE	W	15.000	15.000	0.00	UNCHANGED
658	74839	BROMOMETHANE	W	15.000	15.000	0.00	UNCHANGED
659	67663	CHLOROFORM	W	5.600	6.000	0.03	MODERATE CHANG

WST_CODE=K136

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
660	106934	1,2-DIBROMOETHANE	W	15.000	15.000	0.00	UNCHANGED
661	74839	BROMOMETHANE	W	15.000	15.000	0.00	UNCHANGED
662	67663	CHLOROFORM	W	5.600	6.000	0.03	MODERATE CHANG

WST_CODE=P010

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
663	7440382	ARSENIC	E	5.600	5.000	-0.05	MODERATE CHANG

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WASTESTREAMS WITH CHANGING TREATMENT STANDARDS

WST_CODE=P011

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDAR	UTS TO BDAT RATIO (LOG)	REMARK
664	7440382	ARSENIC	E	5.600	5.000	-0.05	MODERATE CHANGE

WST_CODE=P012

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
665	7440382	ARSENIC	E	5.600	5.000	-0.05	MODERATE CHANGE

WST_CODE=P013

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
666	7440393	BARIUM	E	52.000	7.600	-0.84	MODERATE CHANGE
667	57125	CYANIDE (AMENABLE)	W	9.100	30.000	0.52	MODERATE CHANGE
668	57125	CYANIDE (TOTAL)	W	110.000	590.000	0.73	MODERATE CHANGE

WST_CODE=P021

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
669	57125	CYANIDE (AMENABLE)	W	9.100	30.000	0.52	MODERATE CHANGE
670	57125	CYANIDE (TOTAL)	W	110.000	590.000	0.73	MODERATE CHANGE

WST_CODE=P029

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
671	57125	CYANIDE (AMENABLE)	W	9.100	30.000	0.52	MODERATE CHANGE
672	57125	CYANIDE (TOTAL)	W	110.000	590.000	0.73	MODERATE CHANGE

WST_CODE=P030

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
673	57125	CYANIDE (AMENABLE)	W	9.100	30.000	0.52	MODERATE CHANGE
674	57125	CYANIDE (TOTAL)	W	110.000	590.000	0.73	MODERATE CHANGE

WST_CODE=P036

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
675	7440382	ARSENIC	E	5.600	5.000	-0.05	MODERATE CHANGE

WST_CODE=P038

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
676	7440382	ARSENIC	E	5.600	5.000	-0.05	MODERATE CHANGE

WST_CODE=P039

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
677	298044	DISULFOTON	W	0.100	6.200	1.79	SIGNIF. LESS STRINGENT

APPENDIX B
ANALYSIS OF UTS IMPACTS
WASTESTREAMS WITH CHANGING TREATMENT STANDARDS

WST_CODE=P063

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
678	57125	CYANIDE (AMENABLE)	W	9.100	30.000	0.52	MODERATE CHANGE
679	57125	CYANIDE (TOTAL)	W	110.000	590.000	0.73	MODERATE CHANGE

WST_CODE=P065 (NOT RESIDUES)

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
680	7439976	MERCURY	E	0.025	0.009	-0.44	MODERATE CHANGE

WST_CODE=P065 (RESIDUES)

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
681	7439976	MERCURY	E	0.200	0.009	-1.35	SIGNIF. MORE STRING

WST_CODE=P071

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
682	298000	METHYL PARATHION	W	0.100	4.600	1.66	SIGNIF. LESS STRING

WST_CODE=P073

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
683	7440020	NICKEL	E	0.320	5.000	1.19	MO[illegible] CHANGE

WST_CODE=P074

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
684	7440020	NICKEL	E	0.320	5.000	1.19	MODERATE CHANGE
685	57125	CYANIDE (AMENABLE)	W	9.100	30.000	0.52	MODERATE CHANGE
686	57125	CYANIDE (TOTAL)	W	110.000	590.000	0.73	MODERATE CHANGE

WST_CODE=P089

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
687	56382	PARATHION	W	0.100	4.600	1.66	SIGNIF. LESS STRING

WST_CODE=P092 (NOT RESIDUES)

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
688	7439976	MERCURY	E	0.025	0.009	-0.44	MODERATE CHANGE

WST_CODE=P092 (RESIDUES)

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
689	7439976	MERCURY	E	0.200	0.009	-1.35	SIGNIF. MORE STRING

WST_CODE=P094

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	[illegible]RK
690	298022	PHORATE	W	0.100	4.600	1.66	SIGNIF. LESS STRING

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WASTESTREAMS WITH CHANGING TREATMENT STANDARDS

WST_CODE=P097

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
691	52857	FAMPHUR	W	0.100	15.000	2.18	SIGNIF. LESS STRINGENT

WST_CODE=P098

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
692	57125	CYANIDE (AMENABLE)	W	9.100	30.000	0.52	MODERATE CHANGE
693	57125	CYANIDE (TOTAL)	W	110.000	590.000	0.73	MODERATE CHANGE

WST_CODE=P099

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
694	7440224	SILVER	E	0.072	0.300	0.62	MODERATE CHANGE
695	57125	CYANIDE (AMENABLE)	W	9.100	30.000	0.52	MODERATE CHANGE
696	57125	CYANIDE (TOTAL)	W	110.000	590.000	0.73	MODERATE CHANGE

WST_CODE=P103

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
697	7782492	SELENIUM	E	5.700	0.160	-1.55	SIGNIF. MORE STRINGENT

WST_CODE=P104

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
698	7440224	SILVER	E	0.072	0.300	0.62	MODERATE CHANGE
699	57125	CYANIDE (AMENABLE)	W	9.100	30.000	0.52	MODERATE CHANGE
700	57125	CYANIDE (TOTAL)	W	110.000	590.000	0.73	MODERATE CHANGE

WST_CODE=P106

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
701	57125	CYANIDE (AMENABLE)	W	9.100	30.000	0.52	MODERATE CHANGE
702	57125	CYANIDE (TOTAL)	W	110.000	590.000	0.73	MODERATE CHANGE

WST_CODE=P110

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
703	7439921	LEAD	E	0.510	0.3[illegible]	-0.14	MODERATE CHANGE

WST_CODE=P114

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
704	7782492	SELENIUM	E	5.700	0.160	-1.55	SIGNIF. MORE STRINGENT

WST_CODE=P121

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
705	57125	CYANIDE (AMENABLE)	W	9.100	30.000	0.52	MODERATE CHANGE
706	57125	CYANIDE (TOTAL)	W	110.000	590.000	0.73	MODERATE CHANGE

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WST_CODE=P123

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
707	8001352	TOXAPHENE	W	1.300	2.600	0.30	MODERATE CHANG

WST_CODE=U003

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
708	75058	ACETONITRILE	W	0.170	.	.	STANDARD PENDIN

WST_CODE=U018

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
709	56553	BENZ(A)ANTHRACENE	W	8.200	3.400	-0.38	MODERATE CHANG

WST_CODE=U019

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
710	71432	BENZENE	W	36.000	10.000	-0.56	MODERATE CHANG

WST_CODE=U022

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
711	50328	BENZO(A)PYRENE	W	8.200	3.400	-0.38	MODERATE CHANG

WST_CODE=U025

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
712	111444	BIS(2-CHLOROETHYL)ETHER	W	7.200	6.000	-0.08	MODERATE CHANG

WST_CODE=U032

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
713	7440473	CHROMIUM (TOTAL)	E	0.094	0.330	0.55	MODERATE CHANG

WST_CODE=U036

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
714	57749	CHLORDANE	W	0.130	0.260	0.30	MODERATE CHANG

WST_CODE=U037

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
715	108907	CHLOROBENZENE	W	5.700	6.000	0.02	MODERATE CHANG

WST_CODE=U043

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
716	75014	VINYL CHLORIDE	W	33.000	6.000	-0.74	MODERATE CHANG

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WST_CODE=U044

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
717	67663	CHLOROFORM	W	5.600	6.000	0.03	MODERATE CHANGE

WST_CODE=U045

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
718	74873	CHLOROMETHANE	W	33.000	30.000	-0.04	MODERATE CHANGE

WST_CODE=U050

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
719	218019	CHRYSENE	W	8.200	3.400	-0.38	MODERATE CHANGE

WST_CODE=U051

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
720	7439921	LEAD	E	0.510	0.370	-0.14	MODERATE CHANGE
721	91203	NAPHTHALENE	W	1.500	5.600	0.57	MODERATE CHANGE
722	87865	PENTACHLOROPHENOL	W	7.400	7.400	0.00	UNCHANGED
723	85018	PHENANTHRENE	W	1.500	5.600	0.57	MODERATE CHANGE
724	129000	PYRENE	W	1.500	8.200	0.74	MODERATE CHANGE
725	108883	TOLUENE	W	28.000	10.000	-0.45	MODERATE CHANGE
726	1330207	XYLENES (TOTAL)	W	33.000	30.000	-0.04	MODERATE CHANGE

WST_CODE=U070

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
727	95501	(O)1,2-DICHLOROBENZENE	W	6.200	6.000	-0.01	MODERATE CHANGE

WST_CODE=U071

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
728	541731	(M)1,3-DICHLOROBENZENE	W	6.200	6.000	-0.01	MODERATE CHANGE

WST_CODE=U072

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
729	106467	(P)1,4-DICHLOROBENZENE	W	6.200	6.000	-0.01	MODERATE CHANGE

WST_CODE=U076

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
730	75343	1,1-DICHLOROETHANE	W	7.200	6.000	-0.08	MODERATE CHANGE

WST_CODE=U077

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
731	107062	1,2-DICHLOROETHANE	W	7.200	6.000	-0.08	MODERATE CHANGE

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WST_CODE=U078

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
732	75354	1,1-DICHLOROETHYLENE	W	33.000	6.000	-0.74	MODERATE CHANG

WST_CODE=U079

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
733	156605	TRANS-1,2-DICHLOROETHYLENE	W	33.000	30.000	-0.04	MODERATE CHANG

WST_CODE=U080

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
734	75092	METHYLENE CHLORIDE	W	33.000	30.000	-0.04	MODERATE CHANG

WST_CODE=U120

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
735	206440	FLUORANTHENE	W	8.200	3.400	-0.38	MODERATE CHANG

WST_CODE=U121

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
736	75694	TRICHLOROMONOFLUOROMETHANE	W	33.000	30.000	-0.04	MODERATE CHANG

WST_CODE=U127

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
737	118741	HEXACHLOROBENZENE	W	37.000	10.000	-0.57	MODERATE CHANG

WST_CODE=U128

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
738	87683	HEXACHLOROBUTADIENE	W	28.000	5.600	-0.70	MODERATE CHANG

WST_CODE=U129

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
739	319846	ALPHA - BHC	W	0.660	0.066	-1.00	MODERATE CHANG
740	319857	BETA - BHC	W	0.660	0.066	-1.00	MODERATE CHANG
741	319866	DELTA - BHC	W	0.660	0.066	-1.00	MODERATE CHANG
742	58899	GAMMA-BHC (LINDANE)	W	0.660	0.066	-1.00	MODERATE CHANG

WST_CODE=U130

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
743	77474	HEXACHLOROCYCLOPENTADIENE	W	3.600	2.400	-0.18	MODERATE CHANG

WST_CODE=U131

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
744	67721	HEXACHLOROETHANE	W	28.000	30.000	0.03	MODERATE CHAN

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WST_CODE=U136

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
745	7440382	ARSENIC	E	5.600	5.000	-0.05	MODERATE CHANGE

WST_CODE=U137

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
746	193395	INDENO(1,2,3-CD)PYRENE	W	8.200	3.400	-0.38	MODERATE CHANGE

WST_CODE=U144

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
747	7439921	LEAD	E	0.510	0.370	-0.14	MODERATE CHANGE

WST_CODE=U145

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
748	7439921	LEAD	E	0.510	0.370	-0.14	MODERATE CHANGE

WST_CODE=U146

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
749	7439921	LEAD	E	0.510	0.370	-0.14	MODERATE CHANGE

WST_CODE=U151 (NOT RESIDUES)

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
750	7439976	MERCURY	E	0.025	0.009	-0.44	MODERATE CHANGE

WST_CODE=U151 (RESIDUES)

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
751	7439976	MERCURY	E	0.200	0.009	-1.35	SIGNIF. MORE STRINGENT

WST_CODE=U158

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
752	101144	4,4'-METHYLENE-BIS-(2-CHLORO	W	35.000	30.000	-0.07	MODERATE CHANGE

WST_CODE=U165

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
753	91203	NAPHTHALENE	W	3.100	5.600	0.26	MODERATE CHANGE

WST_CODE=U183

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
754	608935	PENTACHLOROBENZENE	W	37.000	10.000	-0.57	MODERATE CHANGE

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WST_CODE=U204

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
755	7782492	SELENIUM	E	5.700	0.160	-1.55	SIGNIF. MORE STRIN

WST_CODE=U205

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
756	7782492	SELENIUM	E	5.700	0.160	-1.55	SIGNIF. MORE STRIN

WST_CODE=U207

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
757	95943	1,2,4,5-TETRACHLOROBENZENE	W	19.000	14.000	-0.13	MODERATE CHANG

WST_CODE=U208

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
758	630206	1,1,1,2-TETRACHLOROETHANE	W	42.000	6.000	-0.85	MODERATE CHANG

WST_CODE=U209

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
759	79345	1,1,2,2-TETRACHLOROETHANE	W	42.000	6.000	-0.85	MODERATE CHANG

WST_CODE=U210

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
760	127184	TETRACHLOROETHENE	W	5.600	6.000	0.03	MODERATE CHANG

WST_CODE=U211

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
761	56235	CARBON TETRACHLORIDE	W	5.600	6.000	0.03	MODERATE CHANG

WST_CODE=U220

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
762	108883	TOLUENE	W	28.000	10.000	-0.45	MODERATE CHANG

WST_CODE=U225

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
763	75252	TRIBROMOMETHANE	W	15.000	.	.	STANDARD PENDIN

WST_CODE=U226

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
764	71556	1,1,1-TRICHLOROETHANE	W	5.600	6.000	0.03	MOD[illegible] CHANG

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WST_CODE=U227

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
765	79005	1,1,2-TRICHLOROETHANE	W	5.600	6.000	0.03	MODERATE CHANGE

WST_CODE=U228

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
766	79016	TRICHLOROETHENE	W	5.600	6.000	0.03	MODERATE CHANGE

WST_CODE=U235

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
767	126727	TRIS(2,3-DIBROMOPROPYL) PHOS	W	0.100	.	.	STANDARD PENDING

WST_CODE=U239

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
768	1330207	XYLENES (TOTAL)	W	28.000	30.000	0.03	MODERATE CHANGE

WST_CODE=U243

OBS	CAS NUMBER	CONSTITUENT NAME	WASTE/ EXTRACT	BDAT STANDARD	UTS STANDARD	UTS TO BDAT RATIO (LOG)	REMARK
769	1888717	HEXACHLOROPROPENE	W	28.000	30.000	0.03	MODERATE CHANGE

APPENDIX C

PERCENTAGE (BY VOLUME) OF TC WASTES ASSIGNED TO TREATMENT TECHNOLOGIES (Including Average)

Nonwastewaters

Incineration	28%
Thermal Desorption	25%
Incineration & Stabilization	23%
Average Cost Used	23%

Soils

Thermal Desorption	48%
Thermal Desorption & Stabilization	5%
Incineration & Stabilization	1%
Incineration	<1%
Average Cost Used	46%

Debris

Incineration	38%
Thermal Desorption & Stabilization	8%
Thermal Desorption	7%
Extraction	3%
Incineration & Stabilization	1%
Average Cost Used	44%

APPENDIX D
UNIT COSTS USED IN PHASE II RULE TC ANALYSIS

For TC Nonwastewaters	Cost $/ton	Source
Biological/Chemical Treatment (off-site)	974	A
Organic Recovery/Extraction (off-site)	310	A
Stabilization (off-site)	220	A
Stabilization (on-site)	33	C
Thermal Desorption (off-site)	515	B
Thermal Desorption (on-site)	100	B
Incineration (off-site)	1570 (< 1000 tons)	C
	1280 (1000 to 5000 tons)	C
	1135 (> 5000 tons)	C
Incineration (on-site)	520	C
For TC Hazardous Soils		
Biological/Chemical Treatment (off-site)	320	C
Biological/Chemical Treatment (on-site)	261	C
Solvent Extraction (off-site)	532	A
Solvent Extraction (on-site)	475	C
Stabilization (off-site)	220	A
Stabilization (on-site)	53	C
Thermal Desorption/Soil Vapor Extraction (off-site)	515	B
Thermal Desorption/Soil Vapor Extraction (on-site)	100	B
Incineration (off-site)	1470 (< 1000 tons)	C
	1200 (1000 to 5000 tons)	C
	1060 (> 5000 tons)	C
Incineration (on-site)	1150	C
Soil Washing (on-site)	100	C

For TC Hazardous Debris

Biological/Chemical Treatment (on-site)	75	B
Extraction (off-site)	390	B
Extraction (on-site)	350	B
Stabilization (off-site)	550	B
Stabilization (on-site)	53	B
Thermal Desorption (off-site)	55	B
Thermal Desorption (on-site)	55	B
Incineration (off-site)	2110 (< 1000 tons)	C
	1720 (1000 to 5000 tons)	C
	1525 (> 5000 tons)	C
Incineration (on-site)	1720	B

Sources:

A 1990 Survey of Selected Firms in the Hazardous Waste Management Industry, July 1992, U.S. EPA Office of Policy Analysis

B Cost and Economic Impact Analysis of Land Disposal Restrictions for Newly Listed Wastes [illegible] Contaminated Debris (Phase I LDRs), June 1992, U.S. EPA Office of Solid Waste

C Quotes from vendors collected for this analysis.

APPENDIX E

Cost of Affected TC Waste by TC Code and Physical Form

TC Code	Debris	Nonwastewater	Soil	Total
D018	27,758,335.01	69,983,334.93	29,119,184.29	126,860,854.23
D019	200,509.55	4,736,894.06	92,437.86	5,029,841.47
D020	16,490.26	2,406,928.45	147,246.85	2,570,665.56
D021	339,878.69	4,436,730.48	473,495.01	5,250,104.18
D022	69,551.27	4,114,821.08	93,223.16	4,277,595.51
D023	58,746.54	4,045,430.45	9,453.91	4,113,630.90
D024	51,532.05	616,497.46	9,148.94	677,178.45
D025	62,014.22	353,761.39	9,148.94	424,924.55
D026	2,285,473.83	1,324,194.27	40,451.08	3,650,119.18
D027	398,138.43	1,445,389.03	477,568.78	2,321,096.24
D028	414,173.04	8,476,747.93	41[illegible].750.12	9,308,671.09
D029	480,589.71	3,002,901.27	53[illegible].139.25	4,019,630.23
D030	112,984.26	586,388.64	646.416.91	1,345,789.81
D031	13,398.33	269,560.90	5,184.40	288,143.63
D032	70,083.59	3,097,175.76	1[illegible],954.37	3,186,213.72
D033	106,156.02	467,632.54	18,297.88	592,086.44
D034	29,888.59	437,159.98	18,297.88	485,346.45
D035	345,215.65	4,417,846.20	118,557.48	4,881,619.33
D036	89,218.23	365,584.31	261,061.01	715,863.55
D037	179,063.00	597,717.64	102,468.15	879,248.79
D038	417,109.10	2,272,178.72	172,915.00	2,862,202.82
D039	1,156,115.84	6,535,027.62	980,171.30	8,671,314.76
D040	1,236,249.34	5,230,936.14	930,014.81	7,397,200.29
D041	22,674.10	145,918.41	5,184.40	173,776.91
D042	22,674.10	155,541.32	5,184.40	183,399.82
D043	90,592.40	15,435,045.14	23,642.87	15,549,280.41
Total	36,026,855.15	144,957,344.12	34,731,599.05	215,715,798.32

APPENDIX F

EXAMPLE CALCULATIONS FOR ESTIMATING EMISSIONS (HUMAN HEALTH BENEFITS - AIR PATHWAY)

Listed below is the step-by-step approach, with example calculations, that was used for calculating emissions in estimating benefits from the air pathway. For the sake of example, these calculations are based on a hypothetical source scenario and use equations and parameter values in the Phase II LDR benefits analysis. *For all equations, the parameters are defined at the end of this appendix.*

Hypothetical Source Scenario

A waste containing benzene at a concentration of 1,000 ppm concentration is being managed at a Subtitle C landfill. The total waste volume managed in the landfill is 16,200 cubic meters. Assuming a depth of 4 meters, the surface area of the landfill is about 4,050 square meters.

Calculations Used to Estimate Total Emission Rates

The "total emission rate" is the sum of the volatilization emission and particulate emission rates. The only particulate emissions considered in the analysis are those due to wind and vehicular traffic. The emissions resulting from other mechanical disturbances such as loading and unloading operations and daily spreading operations are ignored because they result in very low emissions compared to volatilization emissions for TC constituents.

A. Volatilization Emissions

The volatilization algorithm described by Hwang and Falco[1] is used to calculate N, the mass flux (g/s/cm^2) from uncovered landfills.

$$N = \frac{2\, D_i\, \theta^{4/3}}{\sqrt{\pi\, \alpha\, t}} \times \frac{H}{K_d} \times \frac{C_s}{XF1} \tag{1}$$

where α, the effective diffusion parameter, and K_d, the soil-water partitioning coefficient for organics, are calculated as follows:

$$\alpha = \frac{D_i \theta^{4/3}}{\theta + \rho_s (1-\theta)\, \frac{K_d}{H}} \tag{2}$$

$$K_d = f_{oc} k_{oc} \tag{3}$$

Using the following parameter values, k_d, α, and N are calculated as follows:

f_{oc} = 0.02

k_{oc} = 347.664 ml/g (calculated from k_{ow}, the octanol/water partition coefficient)

D_i = 0.1 cm^2/s

H = 0.2294 (dimensionless)

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[1]Hwang, S.T. and Falco, J.W., "Estimation of Multimedia Exposure Related to Hazardous Waste Facilities," in Pollutants in a Multimedia Environment, Y. Cohen (ed.), Plenum Press, 1986.

Θ = 0.437

ρ_s = 2.65 g/cm^3

C_s = 1,000 mg/kg

t = 31,536,000 sec (assuming 1 year operation)

XF1 = 10^6 mg/kg per g/g

$$K_d = 0.02 \times 347.664 \tag{4}$$

$$K_d = 7.0 \text{ ml/g}$$

$$\alpha = \frac{0.1 \times 0.437^{4/3}}{0.437 + 2.65 \times (1 - 0.437) \times \frac{7.0}{0.2294}} \tag{5}$$

$$\alpha = 7.2\text{E-4 cm}^2\text{/s}$$

$$N = \frac{2 \times 0.1 \times 0.437^{4/3}}{\sqrt{\pi \times 0.00072 \times 31{,}536{,}000}} \times \frac{0.2294}{7.0} \times \frac{1000}{10^6} \tag{6}$$

$$N = 8.1\text{E-9 g/s/cm}^2$$

B. Estimate Particulate Emissions

The empirical equations described in Cowherd[2] are used for estimating emissions due to wind, and an EPA source[3] is used for estimating emissions from vehicular traffic. Calculations showing particulate emissions from wind erosion and vehicular traffic are shown below.

B.1 Particulate Emissions due to Wind Erosion

The equation used to represent the wind erosion of inhalable particulates, PM_{10wind}, is

$$PM_{10_{wind}} = 0.036\ (\ 1\text{-}VG\ )\left(\frac{u_w}{u_t}\right)^3 F\ (x)\ A_s\ XF2 \tag{7}$$

B.2 Particulate Emissions due to Vehicle Traffic

The empirical equation used to represent the emission factor for particulates, E_{mv} (kg/VKT), from an unpaved landfill per vehicle kilometers traveled per hour, VKT, is

$$E_{mv} = 0.36\ (1.7)\ \frac{s}{12} \times \frac{S}{48}\ (\frac{W}{2.7})^{0.7}\ (\frac{w}{4})^{0.5}\ \frac{(365\text{-}pe)}{365} \tag{8}$$

The average hourly emission due to vehicle traffic, PM_{10veh}, is then estimated as

$$PM_{10_{veh}} = 1{,}000\ (g/kg) \times E_{mv} \times VKT \tag{9}$$

---

[2]Cowherd, C., et al., Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination, EPA, Office of Health and Environmental Assessment, 1985.

[3]EPA, Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, 4 ed., EPA/OAQPS, 1985.

Using the following input values, the particulate emissions can be estimated as shown below:

A_s	=	0.4050 hectares
F(x)	=	1.33 (From MMSOILS model)
pe	=	90 days/year
S	=	24 km/hr
s	=	8 percent
u_w	=	3 m/s
u_t	=	4.2 m/s
VG	=	0
VKT	=	3.12 # veh. x km/hr
W	=	15 Mg
w	=	6
x	=	0.886 u_t/u
XF2	=	10^4 m^2/ha
C_i	=	0.001 g/g

$$PM_{10_{wind}} = 0.036 \times (1-0) \times \left(\frac{3}{4.2}\right)^3 \times 1.33 \times 0.4050 \times 10^4 \qquad (10)$$

$$PM_{10wind} = 71 \text{ g/hr}$$

$$8E_{mv} = 0.36 \times (1.7) \times \frac{8}{12} \times \frac{24}{48} \times \left(\frac{15}{2.7}\right)^{0.7} \times \left(\frac{6}{4}\right)^{0.5} \times \frac{(365-90)}{365} \qquad (11)$$

$$E_{mv} = 0.63 \text{ kg/VKT}$$

$$PM_{10_{veh}} = 1{,}000\ (g/kg) \times 0.6252 \times 3.12$$

$$PM_{10veh} = 2{,}000\ g/hr$$

The total emission rate, N_{tot}, is calculated as the sum of the emission rates from volatilization emissions and particulate emissions from wind erosion and mechanical disturbances. Note that the emission rate from volatilization is the product of mass flux (N) and unit area (A_s)

$$N_{tot} = [N \times A_s] + [(PM_{10wind} + PM_{10veh}) \times C_i \times (1/3600)]$$

$$= [8.1E\text{-}9 \times (4.050 \times 10^7)] + [(71 + 2{,}000) \times (1E\text{-}3) \times (1/3{,}600)]$$

$$= 3.3E\text{-}1 + 5.8E\text{-}4\ g/s$$

$$= 0.33\ g/s$$

DEFINITIONS OF PARAMETERS

1. Parameters used in the volatilization emission calculations

N	=	mass flux ($g/s/cm^2$)
α	=	effective diffusion parameter (cm^2/s)
C_s	=	adsorbed chemical concentration in soil (mg/kg)
D_i	=	diffusion coefficient of compound in air (cm^2/s)
H	=	Henry's law constant in concentration form (dimensi. n ess)

K_d = soil-water partition coefficient (ml/g)

t = time (sec)

XF1 = units conversion factor (10^6 mg/kg per g/g)

θ = porosity (dimensionless)

ρ_s = particle density of soil (g/cm^3)

f_{oc} = fraction of organic carbon (dimensionless)

k_{oc} = adsorption coefficient on organic carbon (ml/g)

A_s = area of site (hectares)

2. Parameters used in particulate emission calculations

E_{mv} = emission factor from an unpaved road per vehicle- kilometer of travel (kg/VKT)

F(x) = plotted function from EPA (1985a) (dimensionless)

PM_{10wind} = emission rate for inhalable particulates, less than 10 µm. from wind erosion (g/hr)

PM_{10veh} = emission rate for inhalable particulates, less than 10 µm. from vehicle traffic (g/hr)

pe = number of days per year with at least 0.01 inches of precipitation (days/year)

S = mean vehicle speed (km/hr)

s = percent silt content of road surface (percent)

u_w = mean annual wind speed (m/s)

u_t = threshold velocity at 7 m height (m/s)

VG = fraction of contaminated surface with vegetative cover (dimensionless)

VKT = average vehicle kilometers of travel per hour on unpaved road, (# veh. x km/hr)

W = mean vehicle weight (Mg)

w = mean number of wheels per vehicle (#)

x = dimensionless ratio ($x=0.886\ u_t/u$)

XF2 = units conversion factor (10^4 m^2/ha)

C_i = adsorbed chemical concentration in soil (g/g)

APPENDIX G

BASELINE AND POST-REGULATORY LEACHATE CONCENTRATIONS FOR CARCINOGENIC CONSTITUENTS

FACILITY NUMBER	CONSTITUENT	BASELINE		POST-REGULATORY SCENARIO TREATMENT TO UNIV. STD.	
		CONCENTRATION (mg/l)	RATIO TO RSD	CONCENTRATION (mg/l)[a]	RATIO TO RSD[b]
1	VINYL CHLORIDE	10.097	54,877.4	0.140	760.870
	BENZENE	1.089	90.3	0.160	13.257
2	BENZENE	3.298	273.3	0.160	13.257
	TRICHLOROETHYLENE	2.112	66.4	0.097	3.045
3	BENZENE	24.912	2,064.2	0.160	13.257
4	1,1-DICHLOROETHYLENE	0.301	516.1	0.130	222.985
	CARBON TETRACHLORIDE	0.238	88.6	0.084	31.204
	1,2-DICHLOROETHANE	0.292	76.0	0.210	54.602
	CHLOROFORM	3.118	54.3	0.205	3.573
	BENZENE	0.378	31.4	0.160	13.257
	HEXACHLOROBENZENE	0.002	8.6	0.001	6.809
	TRICHLOROETHYLENE	0.261	8.2	0.097	3.045
	VINYL CHLORIDE	4.6e-04	2.5	4.6e-04	2.490
5	BENZENE	42.202	3,496.7	0.160	13.257
6	BENZENE	983.903	81,523.2	0.160	13.257
	1,2-DICHLOROETHANE	2.920	759.1	0.210	54.602
	CARBON TETRACHLORIDE	2.024	751.9	0.084	31.204
	CHLOROFORM	2.729	47.6	0.205	3.573
	TRICHLOROETHYLENE	0.064	2.0	0.064	2.020

BASELINE AND POST-REGULATORY LEACHATE CONCENTRATIONS FOR CARCINOGENIC CONSTITUENTS

FACILITY NUMBER	CONSTITUENT	BASELINE		POST-REGULATORY SCENARIO TREATMENT TO UNIV. STD.	
		CONCENTRATION (mg/l)	RATIO TO RSD	CONCENTRATION (mg/l)[a]	RATIO TO RSD[b]
7	BENZENE	0.624	51.7	0.160	13.257
8	1,2-DICHLOROETHANE	56.067	14,577.9	0.210	54.602
	VINYL CHLORIDE	0.331	1,797.0	0.140	760.870
	1,1-DICHLOROETHYLENE	0.738	1,265.0	0.130	222.985
	CARBON TETRACHLORIDE	3.303	1,227.0	0.084	31.204
	CHLOROFORM	6.255	109.0	0.205	3.573
	TRICHLOROETHYLENE	1.803	56.7	0.097	3.045
	HEXACHLOROBUTADIENE	0.123	27.4	0.003	0.745
	HEXACHLOROBENZENE	0.004	18.9	0.001	6.809
	HEXACHLOROETHANE	0.126	5.1	0.091	3.[illegible]
9	BENZENE	1.157	95.8	0.160	13.257
10	BENZENE	1.400	116.0	0.160	13.257
11	2,4-DINITROTOLUENE	3.634	7,055.9	0.880	1,708.738
	2,6-DINITROTOLUENE	2.175	4,222.6	0.295	572.298[c]
	1,2-DICHLOROETHANE	0.569	148.1	0.210	54.602
	CARBON TETRACHLORIDE	0.014	5.2	0.014	5.240

BASELINE AND POST-REGULATORY LEACHATE CONCENTRATIONS FOR CARCINOGENIC CONSTITUENTS

FACILITY NUMBER	CONSTITUENT	BASELINE		POST-REGULATORY SCENARIO TREATMENT TO UNIV. STD.	
		CONCENTRATION (mg/l)	RATIO TO RSD	CONCENTRATION (mg/l)[a]	RATIO TO RSD[b]
12	1,1-DICHLOROETHYLENE	11.197	19,205.9	0.130	222.985
	1,2-DICHLOROETHANE	4.307	1,120.0	0.210	54.602
	BENZENE	7.603	630.0	0.160	13.257
	CHLORDANE	0.163	605.2	0.001	2.535
	TRICHLOROETHYLENE	3.264	102.6	0.097	3.045
	HEXACHLOROBENZENE	0.014	63.9	0.001	6.809
	1,4-DICHLOROBENZENE	0.243	16.7	0.036	2.488
	POLYCHLORINATED BIPHENYLS	4.6e-04	10.3	4.6e-04	10.300[b]
13	POLYCHLORINATED BIPHENYLS	37.199	826,648.7	0.003	62.222[b]
	TRICHLOROETHYLENE	459.451	14,440.0	0.097	3.045
	BENZENE	16.656	1,380.0	0.160	13.257
	1,2-DICHLOROETHANE	4.968	1,291.7	0.210	54.602
	1,1-DICHLOROETHYLENE	0.008	14.1	0.008	14.110
	1,4-DICHLOROBENZENE	0.069	4.7	0.036	2.488
14	BENZENE	0.691	57.3	0.160	13.257

BASELINE AND POST-REGULATORY LEACHATE CONCENTRATIONS FOR CARCINOGENIC CONSTITUENTS

FACILITY NUMBER	CONSTITUENT	BASELINE		POST-REGULATORY SCENARIO TREATMENT TO UNIV. STD.	
		CONCENTRATION (mg/l)	RATIO TO RSD	CONCENTRATION (mg/l)[a]	RATIO TO RSD[b]
15	BENZENE	16.542	1,370.7	0.160	13.257
	VINYL CHLORIDE	0.100	545.1	0.100	545.120
	1,1-DICHLOROETHYLENE	0.027	45.6	0.027	45.610
	CHLORDANE	0.006	23.0	0.001	2.535
	1,2-DICHLOROETHANE	0.086	22.5	0.086	22.480
	HEPTACHLOR	5.0e-04	6.4	0.000	2.260
	TRICHLOROETHYLENE	0.122	3.8	0.097	3.045
	CARBON TETRACHLORIDE	0.009	3.2	0.009	3.220
	HEXACHLOROBENZENE	3.6e-04	1.7	3.6e-04	1.650
	2,4-DINITROTOLUENE	0.001	1.4	0.001	1[illegible]
16	PENTACHLOROPHENOL	6.151	2,108.6	0.022	7.542
	ETHYLENE DIBROMIDE	0.007	1,830.2	0.007	1,830.170[b]
	BENZENE	8.015	664.1	0.160	13.257
	TRICHLOROETHYLENE	2.263	71.1	0.097	3.045
	CARBON TETRACHLORIDE	0.134	49.7	0.084	31.204
	METHYLENE CHLORIDE	0.097	2.1	0.097	2.070
17	BENZENE	0.346	28.7	0.160	13.257

BASELINE AND POST-REGULATORY LEACHATE CONCENTRATIONS FOR CARCINOGENIC CONSTITUENTS

FACILITY NUMBER	CONSTITUENT	BASELINE		POST-REGULATORY SCENARIO TREATMENT TO UNIV. STD.	
		CONCENTRATION (mg/l)	RATIO TO RSD	CONCENTRATION (mg/l)[a]	RATIO TO RSD[b]
18	1,1-DICHLOROETHYLENE	1.274	2,184.4	0.130	222.985
	1,2-DICHLOROETHANE	3.182	827.3	0.210	54.602
	BENZENE	1.884	156.1	0.160	13.257
	CARBON TETRACHLORIDE	0.211	78.5	0.084	31.204
	CHLORDANE	0.017	61.9	0.001	2.535
	TRICHLOROETHYLENE	0.572	18.0	0.097	3.045
	HEPTACHLOR	2.8e-04	3.6	0.000	2.260
19	BENZENE	0.999	82.8	0.160	13.257
20	BENZENE	0.800	66.3	0.160	13.257
21	BENZENE	0.500	41.4	0.160	13.257
22	BENZENE	2.553	211.6	0.160	13.257
23	DICHLOROETHYL ETHER	0.354	1,113.5	0.220	691.824[b]
	1,2-DICHLOROETHANE	2.105	547.3	0.210	54.602
	CHLOROFORM	13.611	237.2	0.205	3.573
	1,1-DICHLOROETHYLENE	0.012	20.0	0.012	19.960
	BENZENE	0.020	1.7	0.020	1.670
24	CARBON TETRACHLORIDE	0.555	206.1	0.084	31.204
	CHLOROFORM	5.548	96.7	0.205	3.573
	BENZENE	0.860	71.3	0.160	13.257
25	BENZENE	0.346	28.7	0.160	13.257
26	BENZENE	5.809	481.4	0.160	13.257
27	BENZENE	1.110	92.0	0.160	13.257
28	BENZENE	2.000	165.7	0.160	13.257

BASELINE AND POST-REGULATORY LEACHATE CONCENTRATIONS FOR CARCINOGENIC CONSTITUENTS

FACILITY NUMBER	CONSTITUENT	BASELINE		POST-REGULATORY SCENARIO TREATMENT TO UNIV. STD.	
		CONCENTRATION (mg/l)	RATIO TO RSD	CONCENTRATION (mg/l)[a]	RATIO TO RSD[b]
29	BENZENE	187.630	15,546.5	0.160	13.257
30	1,2-DICHLOROETHANE	7.685	1,998.1	0.210	54.602
	BENZENE	5.049	418.3	0.160	13.257
	VINYL CHLORIDE	0.003	17.7	0.003	17.740
31	BENZENE	3.359	278.4	0.160	13.257
32	BENZENE	15.000	1,242.9	0.160	13.257
33	BENZENE	1.811	150.0	0.160	13.257
34	BENZENE	5.000	414.3	0.160	13.257
35	BENZENE	0.489	40.5	0.160	13.257
36	BENZENE	10.000	828.6	0.160	13.[illegible]

Note: Data presented in this appendix have been computer generated and contain non-significant figures.

a. The Phase II rule will set treatment standards for TC wastes at "universal standard" levels. For organics, universal standards will be based on totals analysis (i.e., mg/kg), and for metals universal standards will be based on leachate analysis (i.e., mg/l). Post-regulatory concentrations for organics in this appendix have been calculated by applying the Organic Leachate Model (OLM) to the totals concentrations in drafts of the Phase II LDRs rule.

b. The risk specific doses (RSDs) in this appendix are based on 10^{-5} excess lifetime cancer risk.

c. If treatment is required only for TC constituents, the post-regulatory concentration for this constituent may be different than indicated.

APPENDIX H

GEMS/GAMS MODELING ANALYSIS

This appendix presents a brief description of the GEMS/GAMS model, print-outs showing example "sessions" of a GEMS/GAMS run, and site-specific and chemical-specific model inputs used in the air benefits analysis. Attachment H-1 provides an overview of the GEMS/GAMS model. An example session using GEMS/GAMS is provided in Attachment H-2. Attachment H-3 provides site-specific information used in the analysis. Chemical-specific information is provided in Attachment H-4.

Attachment H-1
Overview of the GEMS/GAMS Model[1]

The Graphical Exposure Modeling System (GEMS) is a computerized information management tool designed to allow quick analysis of environmental problems. GEMS has evolved, since its development in 1981, into a system that combines the power of over 40 different modeling and statistical analytical tools into one easy-to-use system. GEMS ties together several previously discrete analysis tools into a coordinated system that allows for multiple types of analysis. It facilitates the extraction and manipulation of data from several component databases and models. GEMS is used primarily to assess the fate of chemicals released to the environment and to determine the extent of human exposure and resultant risk. GEMS allows the user to:

- Estimate chemical properties;
- Assess the fate of chemicals in receiving environments;
- Model resulting chemical concentrations;
- Determine the number of people potentially exposed; and
- Estimate the resultant human exposure and risk.

GEMS is housed on the VAX Cluster of computers at the National Computer Center (NCC). Once an account with the NCC has been opened, GEMS can be accessed using a personal computer and a modem by dialing into the mainframe. The system uses several environmental models to simulate the migration of chemicals through air, soil, groundwater, and surface water. The fate of a chemical can be evaluated using a model for one media or multimedia. The key steps involved in using GEMS are: (1) choosing a model; (2) data input; (3) running the model; and (4) viewing output tables.

GEMS provides four different models to estimate concentrations of chemicals released into the air. These four models are: GEMS Atmospheric Modeling Subsystem (GAMS), INtegrated PUFF (INPUFF), PoinT PLUme (PTPLU), and BOXMOD. In general, BOXMOD and PTPLU are used as screening-level models and GAMS and INPUFF are used for more refined analysis. For the current modeling task, GAMS was selected as the atmospheric model since it is the only non-screening model that estimates annual average concentrations, annual exposure, and lifetime and annual cancer risk. In addition, GAMS incorporates the Industrial Source Complex Long-Term (ISCLT) model. Furthermore, GAMS can consider up to twenty source categories with up to nine emission type entries within each category for an unlimited number of source locations for modeling.

ISCLT is EPA's state-of-the-art atmospheric model that combines and enhances various dispersion model algorithms into a computer program that can be used to assess the air quality impact of emissions from a wide variety of sources associated with an industrial source complex. ISCLT may be used as either a screening or a detailed model to estimate atmospheric concentration or deposition values. It is possible to estimate the population exposed to various

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[1]The information in this attachment is summarized from "*GEMS User's Guide*," Office of Toxic Substances, U.S. EPA, March 1989 and "*GAMS Version 3.0 User's Guide*," Office of Pesticides and Toxic Substances, U.S. EPA, June 1990.

levels of pollutant concentration through the integration of ISCLT within GAMS. ISCLT is implemented in GAMS to estimate annual average concentrations around each source on a polar coordinate system. Concentration estimates are calculated at three points along the centerline of each sector segment. ISCLT accepts stack, area, and volume source types; for the Phase II LDR RIA, EPA simulated area sources.

The GAMS Exposure and Risk Estimation (GAMSERE) procedure is used to generate exposure and risk estimations based on the results of ISCLT modeling. Two basic types of GAMS reports, Comptabs and Digests, can be generated from GAMSERE. The Comptabs are comprehensive tables of results that can be tabulated by a combination of source category and emission type, by source category, by emission type, and across all source categories and emission types. The exposure and dosage tables give cumulative population exposed by concentration level, and the risk tables give population exposed, order of magnitude risk levels, and excess cases of cancer.

The Digests contain total results compiled by source category. An Exposure Digest contains the maximum, minimum, and weighted average estimated concentrations; the total modeled population; and the total exposure by source category. The Risk Digest contains population at risk by order of magnitude risk levels and by source category. The Cases Digest contains the modeled population, the weighted average individual risk, the total number of estimated lifetime excess cancer cases, annual incidence, the maximum exposed individual risk, and the number of persons exposed at the maximum risk by source category. For further information on GEMS/GAMS, refer to "GEMS User's Guide," Office of Toxic Substances, U.S. EPA, March 1989 and "GAMS Version 3.0 User's Guide," Office of Pesticides and Toxic Substances, U.S. EPA, June 1990.

Attachment 2
Example Session of GEMS/GAMS Model

```
GEMS


*****************************************************************
*                          G  E  M  S                           *
*---------------------------------------------------------------*
*                                                               *
* GEMS can now be used on the VAX scratch pack.  To use GEMS there  *
* be sure to set default to WORK_PACK:[SCRATCH].  You can use a sub  *
* directory under [SCRATCH] for your work (in fact it's recommended)  *
* and GEMS should work fine.                                    *
*                                                               *
* Current NEWS Bulletins                                        *
* Bulletin      Description                                     *
* --------      -------------------------------------------------*
* NEW_PROC       New versions of TRIAIR, SUPERPOP, SITERET & CENSUS.  *
* TRIAIR        TRIAIR has been removed from GEMS.  There is a new  *
*               version which is available in TGEMS for testing.  *
*****************************************************************


MENU: Terminal Type Specification

     1. VT100-compatible terminal        2. Tektronix 4010 terminal
     3. VT100 with TEK4010 emulator      4. Tektronix 4014 terminal
     5. 80  column ASCII terminal        6. Tektronix 4105 terminal
     7. 132 column ASCII terminal        8. Tektronix 4106 terminal
     9. LA120 DECwriter terminal        10. Tektronix 4107 terminal
    11. Tektronix 4125 terminal         12. Tektronix 4325 terminal

Please identify your terminal type by number
? 7


                GRAPHICAL EXPOSURE MODELING SYSTEM

                          Version  10.0

                          developed by

                GENERAL SCIENCES CORPORATION

                              for

              U.S. ENVIRONMENTAL PROTECTION AGENCY
            OFFICE OF PESTICIDES AND TOXIC SUBSTANCES


A series of HELP information is available by entering HELP or TUTOR command.
Use the PR procedure in the Utilities operation to report problems in GEMS.


MENU: Graphical Exposure Modeling System

1.  Estimation                                                  (ES)
2.  Modeling                                                    (MO)
3.  Geodata Handling                                            (GH)
4.  File Management                                             (FM)
5.  Statistics                                                  (ST)
6.  Graphics                                                    (GR)
7.  Utilities                                                   (UT)
8.  Information and News                                        (IN)

Enter an option number or a procedure name (in parentheses)
or a command: HELP, HELP option, BACK, CLEAR, EXIT, TUTOR
GEMS> GAMS
```

```
MENU: GAMS SELECTION MENU

1.  Set up atmospheric modeling                          (GAMSATMOSET)
2.  Run atmospheric modeling                             (GAMSATMORUN)
3.  Exposure and risk estimation                         (GAMSERE)
4.  GAMS Graphics                                        (GAMSGRAPH)
5.  Estimate size of GAMS run                            (GAMSRUNEST)
6.  GAMS Utilities                                       (GAMSUTIL)
7.  Clean up a GAMS Study                                (GAMSCLEAN)

Enter an option number or a procedure name (in parentheses)
or a command: HELP, HELP option, BACK, CLEAR, EXIT, TUTOR
GEMS> 1


MENU: Study Name and Type

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  STUDY     Name of study (10 chars)
2.  STUDYTYP  Type of study (NEW/OLD)             NEW
3.  SESSION   Name of session (10 chars)

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 1 SITE73, 3 FIRST

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Study Models and Title

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  STDYMODL  Study models (ISCLT,TOXBOX,BOTH)
2.  STDYTITL  Title for study (80 chars)

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 1 ISCLT, 2 POST-REGULATORY SCENARIO AT DOW CHEMICAL -

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Concentration / Deposition Option

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  ISW1      Concentration or Deposition (C/D)   C

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: ISCLT Single Site Mode

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  ONLYSITE  Single site study (Y/N)             NO

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE
```

```
MENU: Modeled Chemicals

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  CHEMNAME  Chemical name (60 chars)
2.  STATE     State of chemical (G/P)              GAS
3.  DECAY     Decay coefficient                    0

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 1 1.1-DICHLOROETHYLENE

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Modeled Chemicals

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  CHEMNAME  Chemical name (60 chars)
2.  STATE     State of chemical (G/P)              GAS
3.  DECAY     Decay coefficient                    0

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 1 1.2-DICHLOROETHANE

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Modeled Chemicals

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  CHEMNAME  Chemical name (60 chars)
2.  STATE     State of chemical (G/P)              GAS
3.  DECAY     Decay coefficient                    0

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 1 BENZENE

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Modeled Chemicals

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  CHEMNAME  Chemical name (60 chars)
2.  STATE     State of chemical (G/P)              GAS
3.  DECAY     Decay coefficient                    0

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 1 CHLOROFORM

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE
```

```
MENU: Modeled Chemicals

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  CHEMNAME  Chemical name (60 chars)
2.  STATE     State of chemical (G/P)              GAS
3.  DECAY     Decay coefficient                    0

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 1 DICHLOROETHYL ETHER

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Modeled Chemicals

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  CHEMNAME  Chemical name (60 chars)
2.  STATE     State of chemical (G/P)              GAS
3.  DECAY     Decay coefficient                    0

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 1 TRICHLOROETHYLENE

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Modeled Chemicals

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  CHEMNAME  Chemical name (60 chars)
2.  STATE     State of chemical (G/P)              GAS
3.  DECAY     Decay coefficient                    0

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: ISCLT Regulatory Switch Option

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  ISW22     Regulatory Default Option (Y/N)      Y

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: ISCLT Regulatory Switch Option

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  ISW23     Modeling Sulfur Dioxide (Y/N)        N

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE
```

```
MENU: ISCLT Site Description

ref parmname        parameter description          parameter value      index
--- --------        ------------------------------- ------------------  -----
1.  SITENAME        Name of site (24 chars)
2.  LOCMETH         Geographic Location Method     LLDMS

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 1 DOW CHEMICAL - TEXAS, 2 ZIPCODE

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: ISCLT Site Location and Meteorology - Site : DOW CHEMICAL - TEXA

ref parmname        parameter description          parameter value      index
--- --------        ------------------------------- ------------------  -----
1.  ZIPCODE         Zip code of the location
2.  ISW9            Rural/Urban3 option            RURAL
3.  SITEMET         Site specific Met data (Y/N)   N

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 1 77541, 2 URBAN3

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


STAR Station Selection : DOW CHEMICAL - TEXAS

 WBAN                                                          PERIOD OF  DISTANCE
NUMBER     STATION NAME                  LATITUDE   LONGITUDE   RECORD      (km)
------     ------------                  --------   ---------   ---------  --------
12923  GALVESTON/SCHOLES TX              29.2667    94.8667    1956-1960 ^F   58.9
12906  HOUSTON/ELLINGTON TX              29.6167    95.1667    1966-1970 ^E   76.1
12918  HOUSTON/HOBBY TX                  29.6500    95.2833    1964-1968 ^F   77.9
12960  HOUSTON/INTCONT TX                29.9833    95.3667    1981-1985 ^F  114.6
12912  VICTORIA/FOSTER TX                28.8500    96.9167 -  1965-1974 ^F  152.3
12917  PRT ARTHUR/JEFFERSON CO TX        29.9500    94.0167    1981-1985 ^F  170.5
12926  CORPUS CHRISTI TX                 27.7000    97.2667    1965-1969 ^F  233.0

Enter the WBAN number of your selected star station
Default = 12923
GEMS>


MENU: ISCLT Site Description

ref parmname        parameter description          parameter value      index
--- --------        ------------------------------- ------------------  -----
1.  SITENAME        Name of site (24 chars)
2.  LOCMETH         Geographic Location Method     ZIPCODE

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE

Your eastern most site is DOW CHEMICAL - TEXAS
with a longitude of     95.3550 degree

Will this be the eastern most site in your study
GEMS> YES
```

```
MENU: ISCLT Receptor Options

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  SAMEGRID  All sites same grid (Y/N)            YES
2.  ISW4      Receptor terrain (Y/N)               NO
3.  ISW25     Receptor heights above ground (Y/N)  NO

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 3 YES

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: ISCLT Polar Grid Type - All Sites

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  GRIDTYPE  Standard or Special Polar grid syste  STANDARD

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Flagpole receptor heights option

1.  Use the same height at each receptor
2.  Use different heights at each receptor


Enter an option number or a command: HELP,BACK,END,CLEAR,EXIT
? 1


MENU: Receptor heights entry - DOW CHEMICAL - TEXAS

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  RHTALL    Flagpole receptor height (m)         0

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 1 2

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> REVIEW


MENU: Receptor heights entry - DOW CHEMICAL - TEXAS

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  RHTALL    Flagpole receptor height (m)         2

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Type of Source Data

ref parmname        parameter description          parameter value      index
```

```
--- --------  ---------------------------------  ------------------  -----
1.  SPECIFIC  Site specific source data (Y/N)     YES
2.  GENERIC   Generic source data (Y/N)           NO

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Specific  Source :  Release   1  at  Site  DOW CHEMICAL - TEXAS

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  SOURNAME  Source category name (* when done)
2.  EMISNAME  Emission type name (12 chars)
3.  TYPE      Source type (stack,volume,area)
4.  CHEMNAME  Name of chemical released

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 1 LANDFILL, 2 FUGITIVE, 3 AREA, 4 1.1-DICHLOROETHYLENE

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> REVIEW


MENU: Specific  Source :  Release   1  at  Site  DOW CHEMICAL - TEXAS

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  SOURNAME  Source category name (* when done)   LANDFILL
2.  EMISNAME  Emission type name (12 chars)        FUGITIVE
3.  TYPE      Source type (stack,volume,area)      AREA
4.  CHEMNAME  Name of chemical released            1.1-DICHLOROETHYLENE

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Source Characterization - Area

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  DX        Cartesian X-coord (m)                0
2.  DY        Cartesian Y-coord (m)                0
3.  H         Height of emission (m)
4.  XO        Width of area source (m)
5.  Q         Source emission (see HELP for units)

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 3 0, 4 34.77, 5 1E-8

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> REVIEW


MENU: Source Characterization - Area

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  DX        Cartesian X-coord (m)                0
2.  DY        Cartesian Y-coord (m)                0
3.  H         Height of emission (m)               0
4.  XO        Width of area source (m)             34.77
5.  Q         Source emission (see HELP for units) 0.1E-07
```

```
Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Specific  Source :  Release   2  at  Site  DOW CHEMICAL - TEXAS

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  SOURNAME  Source category name (* when done)   LANDFILL
2.  EMISNAME  Emission type name (12 chars)        FUGITIVE
3.  TYPE      Source type (stack,volume,area)      AREA
4.  CHEMNAME  Name of chemical released            1.1-DICHLOROETHYLENE

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 4 1.2-DICHLOROETHANE

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Source Characterization - Area

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  DX        Cartesian X-coord (m)                0
2.  DY        Cartesian Y-coord (m)                0
3.  H         Height of emission (m)               0
4.  XO        Width of area source (m)             34.77
5.  Q         Source emission (see HELP for units) 0.1E-07

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 5 2.08E-7

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Specific  Source :  Release   3  at  Site  DOW CHEMICAL - TEXAS

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  SOURNAME  Source category name (* when done)   LANDFILL
2.  EMISNAME  Emission type name (12 chars)        FUGITIVE
3.  TYPE      Source type (stack,volume,area)      AREA
4.  CHEMNAME  Name of chemical released            1.2-DICHLOROETHANE

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 4 BENZENE

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Source Characterization - Area

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  DX        Cartesian X-coord (m)                0
2.  DY        Cartesian Y-coord (m)                0
3.  H         Height of emission (m)               0
4.  XO        Width of area source (m)             34.77
5.  Q         Source emission (see HELP for units) 0.0000002
```

```
Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 5 3E-8

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Specific  Source :  Release   4  at  Site  DOW CHEMICAL - TEXAS

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  SOURNAME  Source category name (* when done)   LANDFILL
2.  EMISNAME  Emission type name (12 chars)        FUGITIVE
3.  TYPE      Source type (stack,volume,area)      AREA
4.  CHEMNAME  Name of chemical released            BENZENE

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 4 CHLOROFORM

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Source Characterization - Area

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  DX        Cartesian X-coord (m)                0
2.  DY        Cartesian Y-coord (m)                0
3.  H         Height of emission (m)               0
4.  XO        Width of area source (m)             34.77
5.  Q         Source emission (see HELP for units) 0.3E-07

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 5 2.7E-7

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Specific  Source :  Release   5  at  Site  DOW CHEMICAL - TEXAS

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  SOURNAME  Source category name (* when done)   LANDFILL
2.  EMISNAME  Emission type name (12 chars)        FUGITIVE
3.  TYPE      Source type (stack,volume,area)      AREA
4.  CHEMNAME  Name of chemical released            CHLOROFORM

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 4 DICHLOROETHYL ETHER

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Source Characterization - Area

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  DX        Cartesian X-coord (m)                0
```

```
2.  DY        Cartesian Y-coord (m)                0
3.  H         Height of emission (m)               0
4.  XO        Width of area source (m)             34.77
5.  Q         Source emission (see HELP for units) 0.0000003

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 5 1.52E-8

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Specific Source : Release  6  at  Site  DOW CHEMICAL - TEXAS

ref parmname        parameter description          parameter value      index
--- --------        ------------------------------ ------------------   -----
1.  SOURNAME        Source category name (* when done)  LANDFILL
2.  EMISNAME        Emission type name (12 chars)       FUGITIVE
3.  TYPE            Source type (stack,volume,area)     AREA
4.  CHEMNAME        Name of chemical released           DICHLOROETHYL ETHER

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 4 TRICHLOROETHYLENE

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Source Characterization - Area

ref parmname        parameter description          parameter value      index
--- --------        ------------------------------ ------------------   -----
1.  DX              Cartesian X-coord (m)                0
2.  DY              Cartesian Y-coord (m)                0
3.  H               Height of emission (m)               0
4.  XO              Width of area source (m)             34.77
5.  Q               Source emission (see HELP for units) 0.152E-07

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 5 9.92E-9

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Specific  Source :  Release  7  at  Site  DOW CHEMICAL - TEXAS

ref parmname        parameter description          parameter value      index
--- --------        ------------------------------ ------------------   -----
1.  SOURNAME        Source category name (* when done)  LANDFILL
2.  EMISNAME        Emission type name (12 chars)       FUGITIVE
3.  TYPE            Source type (stack,volume,area)     AREA
4.  CHEMNAME        Name of chemical released           TRICHLOROETHYLENE

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 1 *

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE
```

```
MENU: ISCLT Output Specifications

ref parmname        parameter description          parameter value      index
--- --------        ---------------------------------- ------------------ -----
1.  TITLE           Page heading label (40 chars)
2.  ISW6            Print input data option        SOURCE
3.  ISW10           Maximum 10 print option        YES
4.  SAVE            Save ISCLT model output (Y/N)  YES

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 1 DOW CHEMICAL - TEXAS

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE

GAMSATMOSET completed, files created.


MENU: GAMS SELECTION MENU

1.  Set up atmospheric modeling                          (GAMSATMOSET)
2.  Run atmospheric modeling                             (GAMSATMORUN)
3.  Exposure and risk estimation                         (GAMSERE)
4.  GAMS Graphics                                        (GAMSGRAPH)
5.  Estimate size of GAMS run                            (GAMSRUNEST)
6.  GAMS Utilities                                       (GAMSUTIL)
7.  Clean up a GAMS Study                                (GAMSCLEAN)

Enter an option number or a procedure name (in parentheses)
or a command: HELP, HELP option, BACK, CLEAR, EXIT, TUTOR
GEMS> 2



MENU: Run GAMS study

ref parmname        parameter description          parameter value      index
--- --------        ---------------------------------- ------------------ -----
1.  STUDYNAM        The studyname of the GAMS run file

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 1 SITE73

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE

Job GAMS (queue NORM_BATCH, entry 101) started on NORM_HYDRA

MENU: GAMS SELECTION MENU

1.  Set up atmospheric modeling                          (GAMSATMOSET)
2.  Run atmospheric modeling                             (GAMSATMORUN)
3.  Exposure and risk estimation                         (GAMSERE)
4.  GAMS Graphics                                        (GAMSGRAPH)
5.  Estimate size of GAMS run                            (GAMSRUNEST)
6.  GAMS Utilities                                       (GAMSUTIL)
7.  Clean up a GAMS Study                                (GAMSCLEAN)

Enter an option number or a procedure name (in parentheses)
or a command: HELP, HELP option, BACK, CLEAR, EXIT, TUTOR
GEMS>

^G^GJob GAMS (queue NORM_BATCH, entry 101) completed


Enter an option number or a procedure name (in parentheses)
or a command: HELP, HELP option, BACK, CLEAR, EXIT, TUTOR
GEMS> 3
```

```
MENU: Gams Exposure Risk Estimation

ref par-name        parameter description          value                index
--- -------- ---------------------------------- ------------------ -----
1.  COMPTAB   Generate COMPTAB Tables (Y/N)        NO
2.  DIGEST    Generate DIGEST Tables (Y/N)         NO

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 1 YES

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: GAMS Postprocessing - CompTab Procedure

ref parmname        parameter description          parameter value      index
--- -------- ---------------------------------- ------------------ -----
1.  CHEMS     Chemical(s) for CompTab                                   (1)
2.  CONCCOMP  Concentration CompTab (Y/N)          NO
3.  DOSECOMP  Reference Dosage CompTab (Y/N)       NO
4.  RISKCOMP  Risk CompTab (Y/N)                   NO
5.  COMPPOP   CompTab population                   1990

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 1


Enter CHEMS(1) GEMS> 1.1-DICHLOROETHYLENE

Enter CHEMS(2) GEMS> 1.2-DICHLOROETHANE

Enter CHEMS(3) GEMS> BENZENE

Enter CHEMS(4) GEMS> CHLOROFORM

Enter CHEMS(5) GEMS> DICHLOROETHYL ETHER

Enter CHEMS(6) GEMS> TRICHLOROETHYLENE


MENU: GAMS Postprocessing - CompTab Procedure

ref parmname        parameter description          parameter value      index
--- -------- ---------------------------------- ------------------ -----
1.  CHEMS     Chemical(s) for CompTab              TRICHLOROETHYLENE    (6)
2.  CONCCOMP  Concentration CompTab (Y/N)          NO
3.  DOSECOMP  Reference Dosage CompTab (Y/N)       NO
4.  RISKCOMP  Risk CompTab (Y/N)                   NO
5.  COMPPOP   CompTab population                   1990

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 2 YES, 4 YES

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> REVIEW


MENU: GAMS Postprocessing - CompTab Procedure

ref parmname        parameter description          parameter value      index
--- -------- ---------------------------------- ------------------ -----
1.  CHEMS     Chemical(s) for CompTab              TRICHLOROETHYLENE    (6)
```

```
2.  CONCCOMP  Concentration CompTab (Y/N)          YES
3.  DOSECOMP  Reference Dosage CompTab (Y/N)       NO
4.  RISKCOMP  Risk CompTab (Y/N)                   YES
5.  COMPPOP   CompTab population                   1990

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Risk CompTab Calculation Method

ref parmname      parameter description          parameter value      index
--- --------  ---------------------------------  ------------------   -----
1.  ANNULIFE  Annual Incidence or Lifetime Cases  L

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: CompTab Specifications

ref parmname      parameter description          parameter value      index
--- --------  ---------------------------------  ------------------   -----
1.  ISCLTLEV  ISCLT Model-Wide CompTab level                          (1)

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 1 IL4

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Dosage and Risk Parameters - 1.1-DICHLOROETHYLENE

ref parmname      parameter description          parameter value      index
--- --------  ---------------------------------  ------------------   -----
1.  AB        Fraction absorbed through lung     1
2.  QSTAR     Potency slope factor
3.  BW        Body weight (kg)                   70
4.  IR        Daily Inhalation Volume Rate (m3/d) 20

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 2 1.8E-1

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Dosage and Risk Parameters - 1.2-DICHLOROETHANE

ref parmname      parameter description          parameter value      index
--- --------  ---------------------------------  ------------------   -----
1.  AB        Fraction absorbed through lung     1
2.  QSTAR     Potency slope factor
3.  BW        Body weight (kg)                   70
4.  IR        Daily Inhalation Volume Rate (m3/d) 20

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 2 9.1E-2

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
```

```
GEMS> NE


MENU: Dosage and Risk Parameters - BENZENE

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  AB        Fraction absorbed through lung      1
2.  QSTAR     Potency slope factor
3.  BW        Body weight (kg)                    70
4.  IR        Daily Inhalation Volume Rate (m3/d) 20

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 2 2.9E-2

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Dosage and Risk Parameters - CHLOROFORM

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  AB        Fraction absorbed through lung      1
2.  QSTAR     Potency slope factor
3.  BW        Body weight (kg)                    70
4.  IR        Daily Inhalation Volume Rate (m3/d) 20

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 2 8.1E-2

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Dosage and Risk Parameters - DICHLOROETHYL ETHER

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  AB        Fraction absorbed through lung      1
2.  QSTAR     Potency slope factor
3.  BW        Body weight (kg)                    70
4.  IR        Daily Inhalation Volume Rate (m3/d) 20

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 2 1.1

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: Dosage and Risk Parameters - TRICHLOROETHYLENE

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------  -----
1.  AB        Fraction absorbed through lung      1
2.  QSTAR     Potency slope factor
3.  BW        Body weight (kg)                    70
4.  IR        Daily Inhalation Volume Rate (m3/d) 20

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> 2 1.7E-2
```

```
Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ....] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE


MENU: GAMS Source Category Combinations

ref parmname        parameter description          parameter value      index
--- --------  ---------------------------------  ------------------   -----
1.  NUCOMBO   New source category combinations     NO

Enter one or more combinations of: reference or parameter name and value(s)
[ref1 value1, ref2 value2, ...] or a command: HELP,NEXT,BACK,END,CLEAR,EXIT
GEMS> NE

Job GAMSPOST (queue NORM_BATCH, entry 113) started on NORM_HYDRA


MENU: GAMS SELECTION MENU

1.  Set up atmospheric modeling                                  (GAMSATMOSET)
2.  Run atmospheric modeling                                     (GAMSATMORUN)
3.  Exposure and risk estimation                                 (GAMSERE)
4.  GAMS Graphics                                                (GAMSGRAPH)
5.  Estimate size of GAMS run                                    (GAMSRUNEST)
6.  GAMS Utilities                                               (GAMSUTIL)
7.  Clean up a GAMS Study                                        (GAMSCLEAN)

Enter an option number or a procedure name (in parentheses)
or a command: HELP, HELP option, BACK, CLEAR, EXIT, TUTOR
GEMS>

^G^GJob GAMSPOST (queue NORM_BATCH, entry 113) completed


Enter an option number or a procedure name (in parentheses)
or a command: HELP, HELP option, BACK, CLEAR, EXIT, TUTOR
GEMS> EXIT

Type YES to confirm the EXIT command; type NO to restart GEMS
GEMS> YES

Temporary data created in the current session

Dataset:  SITE73_C01_SITES     SITE73_C02_SITES     SITE73_C03_SITES
          SITE73_C04_SITES     SITE73_C05_SITES     SITE73_C06_SITES

Press RETURN to delete them, or enter "ALL" to save them, or
enter only names of those temporary data to be saved.
? ALL

$ DIR *.POUT;1

Directory WORK_PACK1:[SCRATCH.SITE73]

C01_SITE73_CC01.POUT;1
                          3   6-APR-1994 15:59:55.42  (RWED,RWED,RE,)
C01_SITE73_CR01.POUT;1
                          3   6-APR-1994 15:59:57.82  (RWED,RWED,RE,)
C02_SITE73_CC01.POUT;1
                          3   6-APR-1994 16:00:00.47  (RWED,RWED,RE,)
C02_SITE73_CR01.POUT;1
                          3   6-APR-1994 16:00:02.32  (RWED,RWED,RE,)
C03_SITE73_CC01.POUT;1
                          3   6-APR-1994 16:00:04.71  (RWED,RWED,RE,)
C03_SITE73_CR01.POUT;1
                          3   6-APR-1994 16:00:06.59  (RWED,RWED,RE,)
C04_SITE73_CC01.POUT;1
                          3   6-APR-1994 16:00:09.46  (RWED,RWED,RE,)
C04_SITE73_CR01.POUT;1
                          3   6-APR-1994 16:00:11.56  (RWED,RWED,RE,)
C05_SITE73_CC01.POUT;1
```

```
                          3   6-APR-1994 16:00:13.92  (RWED,RWED,RE,)
C05_SITE73_CR01.POUT;1
                          3   6-APR-1994 16:00:15.87  (RWED,RWED,RE,)
C06_SITE73_CC01.POUT;1
                          3   6-APR-1994 16:00:18.92  (RWED,RWED,RE,)
C06_SITE73_CR01.POUT;1
                          3   6-APR-1994 16:00:21.31  (RWED,RWED,RE,)

Total of 12 files, 36 blocks.

$ TYPE *CR*.POUT;1

WORK_PACK1:[SCRATCH.SITE73]C01_SITE73_CR01.POUT;1

                    GAMSPOST   6-APR-94 15:59:53   SITE73


                Population at Risk and Excess Cancer Cases
                        From: 1.1-DICHLOROETHYLENE
                   All Modeled ISCLT Source Categories
                         1990 Population Figures

          POPULATION        POPULATION AT RISK        LIFETIME
          RISK LEVEL          (PERSONS)     (%)      CASES       (%)
       ------------------   ------------------    ---------------
                 2.04E-09        1,477    1.20     3.01E-06   57.40
       2.04E-09 - 1.00E-09           0    0.00     0.00E+00    0.00
       1.00E-09 - 1.00E-10       5,626    4.56     1.61E-06   30.76
       1.00E-10 - 1.00E-11      11,955    9.70     3.26E-07    6.22
       1.00E-11 - 1.00E-12      78,197   63.43     2.71E-07    5.18
       1.00E-12 - 5.09E-13      26,019   21.11     2.28E-08    0.44
                            ----------- ------    -------- ------
             Total             123,274  100.00     5.24E-06  100.00

                 Annual incidence:    7.48E-08 Cases/Year
                 Repeat interval:     1.34E+07 Years/Case
                 Max Calculated Risk: 1.04E-08

WORK_PACK1:[SCRATCH.SITE73]C02_SITE73_CR01.POUT;1

                    GAMSPOST   6-APR-94 15:59:53   SITE73


                Population at Risk and Excess Cancer Cases
                        From: 1.2-DICHLOROETHANE
                   All Modeled ISCLT Source Categories
                         1990 Population Figures

          POPULATION        POPULATION AT RISK        LIFETIME
          RISK LEVEL          (PERSONS)     (%)      CASES       (%)
       ------------------   ------------------    ---------------
                 2.16E-08        1,477    1.20     3.19E-05   57.40
       2.16E-08 - 1.00E-08           0    0.00     0.00E+00    0.00
       1.00E-08 - 1.00E-09       5,626    4.56     1.71E-05   30.76
       1.00E-09 - 1.00E-10      12,108    9.82     3.48E-06    6.25
       1.00E-10 - 1.00E-11      95,040   77.10     3.04E-06    5.46
       1.00E-11 - 5.40E-12       9,023    7.32     6.91E-08    0.12
                            ----------- ------    -------- ------
             Total             123,274  100.00     5.56E-05  100.00

                 Annual incidence:    7.94E-07 Cases/Year
                 Repeat interval:     1.26E+06 Years/Case
                 Max Calculated Risk: 1.10E-07

WORK_PACK1:[SCRATCH.SITE73]C03_SITE73_CR01.POUT;1
```

GAMSPOST 6-APR-94 15:59:53 SITE73

Population at Risk and Excess Cancer Cases
From: BENZENE
All Modeled ISCLT Source Categories
1990 Population Figures

POPULATION RISK LEVEL	POPULATION AT RISK (PERSONS)	(%)	LIFETIME CASES	(%)
9.84E-10	1,477	1.20	1.45E-06	57.40
9.84E-10 - 1.00E-10	3,565	2.89	6.44E-07	25.45
1.00E-10 - 1.00E-11	5,858	4.75	2.44E-07	9.65
1.00E-11 - 1.00E-12	58,287	47.28	1.61E-07	6.35
1.00E-12 - 2.46E-13	54,087	43.88	2.93E-08	1.16
Total	123,274	100.00	2.53E-06	100.00

Annual incidence: 3.62E-08 Cases/Year
Repeat interval: 2.77E+07 Years/Case
Max Calculated Risk: 5.03E-09

WORK_PACK1:[SCRATCH.SITE73]C04_SITE73_CR01.POUT;1

GAMSPOST 6-APR-94 15:59:53 SITE73

Population at Risk and Excess Cancer Cases
From: CHLOROFORM
All Modeled ISCLT Source Categories
1990 Population Figures

POPULATION RISK LEVEL	POPULATION AT RISK (PERSONS)	(%)	LIFETIME CASES	(%)
2.47E-08	1,477	1.20	3.65E-05	57.40
2.47E-08 - 1.00E-08	0	0.00	0.00E+00	0.00
1.00E-08 - 1.00E-09	6,775	5.50	2.07E-05	32.59
1.00E-09 - 1.00E-10	12,802	10.38	3.00E-06	4.71
1.00E-10 - 1.00E-11	96,143	77.99	3.32E-06	5.21
1.00E-11 - 6.18E-12	6,077	4.93	4.93E-08	0.08
Total	123,274	100.00	6.36E-05	100.00

Annual incidence: 9.09E-07 Cases/Year
Repeat interval: 1.10E+06 Years/Case
Max Calculated Risk: 1.26E-07

WORK_PACK1:[SCRATCH.SITE73]C05_SITE73_CR01.POUT;1

GAMSPOST 6-APR-94 15:59:53 SITE73

Population at Risk and Excess Cancer Cases
From: DICHLOROETHYL ETHER
All Modeled ISCLT Source Categories
1990 Population Figures

POPULATION RISK LEVEL	POPULATION AT RISK (PERSONS)	(%)	LIFETIME CASES	(%)
2.49E-08	1,477	1.20	3.67E-05	57.40
2.49E-08 - 1.00E-08	0	0.00	0.00E+00	0.00
1.00E-08 - 1.00E-09	6,775	5.50	2.09E-05	32.59
1.00E-09 - 1.00E-10	12,802	10.38	3.02E-06	4.71
1.00E-10 - 1.00E-11	96,143	77.99	3.34E-06	5.21

1.00E-11 - 6.22E-12	6,077	4.93	4.96E-08	0.08
Total	123,274	100.00	6.40E-05	100.00

Annual incidence: 9.15E-07 Cases/Year
Repeat interval: 1.09E+06 Years/Case
Max Calculated Risk: 1.27E-07

WORK_PACK1:[SCRATCH.SITE73]C06_SITE73_CR01.POUT;1

GAMSPOST 6-APR-94 15:59:53 SITE73

Population at Risk and Excess Cancer Cases
From: TRICHLOROETHYLENE
All Modeled ISCLT Source Categories
1990 Population Figures

POPULATION RISK LEVEL	POPULATION AT RISK (PERSONS)	(%)	LIFETIME CASES	(%)
1.91E-10	1,477	1.20	2.82E-07	57.40
1.91E-10 - 1.00E-10	0	0.00	0.00E+00	0.00
1.00E-10 - 1.00E-11	5,626	4.56	1.51E-07	30.76
1.00E-11 - 1.00E-12	11,920	9.67	3.05E-08	6.22
1.00E-12 - 1.00E-13	78,232	63.46	2.54E-08	5.18
1.00E-13 - 4.77E-14	26,019	21.11	2.14E-09	0.44
Total	123,274	100.00	4.91E-07	100.00

Annual incidence: 7.01E-09 Cases/Year
Repeat interval: 1.43E+08 Years/Case
Max Calculated Risk: 9.75E-10

$

Attachment 3: Input Data for GEMS/GAMS Modeling

Facility No.	Area of Release (m^2)	Chemical Released	Emission Rate (g/m^2-s)	
			Baseline	Post-Regulatory
1	2,754	Benzene	2.30E-05	6.48E-07
2	808	Benzene	1.58E-05	6.48E-07
		Nickel	2.00E-09	2.00E-09
3	206	Benzene	7.70E-06	6.49E-07
		Carbon Tetrachloride	7.64E-06	5.20E-07
		Chlorobenzene	1.00E-09	8.50E-10
		Chloroform	3.53E-05	2.71E-07
		Nitrobenzene	1.40E-08	1.40E-08
4	24,087	Benzene	9.58E-06	6.48E-07
5	496	1,2-Dichloroethane	9.73E-07	2.09E-07
		Carbon Tetrachloride	3.39E-08	3.39E-08
		Chlorobenzene	5.00E-10	5.00E-10
		Nitrobenzene	7.58E-07	2.26E-08
		Trichloroethylene	4.13E-09	4.13E-09
6	195	Benzene	2.01E-06	6.49E-07
7	2,850	Benzene	1.10E-03	6.48E-07
8	125	Benzene	3.35E-06	6.49E-07
9	26	Benzene	1.14E-05	6.56E-07
10	157	Benzene	2.01E-06	6.49E-07
11	320	Benzene	2.87E-04	6.48E-07
12	4,095	Benzene	2.67E-05	6.48E-07
13	398	Benzene	5.57E-06	6.48E-07
14	86	Benzene	1.19E-05	6.50E-07
15	75	Benzene	3.47E-06	6.51E-07
16	5,942	1,1-Dichloroethylene	1.30E-06	3.20E-07
		1,2-Dichloroethane	4.00E-07	2.06E-07
		Benzene	2.30E-06	6.48E-07
		Carbon Tetrachloride	2.20E-06	5.20E-07
		Chlorobenzene	1.38E-03	1.01E-07
		Chloroform	1.50E-05	2.70E-07
		Methyl Ethyl Ketone	1.92E-04	6.56E-07
		Trichloroethylene	1.00E-06	2.79E-07
17	304	Benzene	1.09E-05	6.48E-07
		Vinyl Chloride	1.25E-04	4.01E-07
18	698	1,1-Dichloroethylene	2.76E-04	3.20E-07
		1,2-Dichloroethane	1.92E-05	2.09E-07
		1,4-Dichlorobenzene	9.50E-07	5.10E-08
		Benzene	1.91E-04	6.48E-07
		Chlordane	5.90E-07	5.00E-11
		Hexachlorobenzene	5.30E-07	1.10E-08
		Methyl Ethyl Ketone	8.90E-07	6.57E-07
		Trichloroethylene	4.12E-05	2.79E-07

Attachment 3: Input Data for GEMS/GAMS Modeling

Facility No.	Area of Release (m^2)	Chemical Released	Emission Rate (g/m^2-s)	
			Baseline	Post-Regulatory
19	1,209	1,1-Dichloroethylene	1.00E-08	1.00E-08
		1,2-Dichloroethane	6.69E-06	2.08E-07
		Benzene	3.00E-08	3.00E-08
		Chloroform	1.32E-04	2.70E-07
		Dichloroethyl Ether	3.00E-08	1.52E-08
		Trichloroethylene	1.00E-08	9.92E-09
20	2,692	1,2-Dichloroethane	2.37E-05	2.07E-07
		1,4-Dichlorobenzene	1.00E-07	5.09E-08
		Benzene	6.08E-04	6.48E-07
		Methyl Ethyl Ketone	1.30E-06	6.56E-07
		Trichloroethylene	4.64E-03	2.79E-07
21	1,720	Benzene	5.58E-05	6.48E-07
		Trichloroethylene	2.17E-05	2.79E-07
22	222	Benzene	2.07E-04	6.49E-07
		Carbon Tetrachloride	9.40E-07	5.20E-07
		Ethylbenzene	5.45E-05	2.70E-07
		Methyl Ethyl Ketone	1.92E-06	6.60E-07
		Methylene Chloride	6.00E-08	6.00E-08
		Nickel	2.17E-06	1.06E-08
		Toluene	4.45E-04	3.82E-07
		Trichloroethylene	2.40E-05	2.79E-07
		Xylenes (mixed)	6.20E-04	7.46E-07
23	159	1,1-Dichloroethylene	1.12E-05	3.21E-07
		1,2-Dichloroethane	1.23E-05	2.06E-07
		Benzene	2.45E-05	6.49E-07
		Carbon Tetrachloride	1.84E-06	5.21E-07
		Chlordane	3.20E-08	8.00E-11
		Chlorobenzene	2.81E-07	1.02E-07
		Ethylbenzene	6.87E-07	2.70E-07
		Methyl Ethyl Ketone	5.05E-06	6.61E-07
		Nitrobenzene	4.24E-07	2.40E-08
		Toluene	4.17E-06	3.82E-07
		Trichloroethylene	3.16E-06	2.79E-07
		Xylenes (mixed)	5.55E-07	5.55E-07
24	4	Benzene	7.46E-06	7.00E-07
25	501	Benzene	2.40E-03	6.48E-07
26	96	Benzene	5.75E-05	6.50E-07
		Ethylbenzene	6.96E-05	2.71E-07
		Toluene	9.77E-05	3.83E-07
		Xylenes (mixed)	2.92E-05	7.50E-07

Attachment 3: Input Data for GEMS/GAMS Modeling

Facility No.	Area of Release (m^2)	Chemical Released	Emission Rate (g/m^2-s)	
			Baseline	Post-Regulatory
27	181	1,1-Dichloroethylene	4.99E-06	3.21E-07
		1,2-Dichloroethane	8.49E-04	2.06E-07
		Carbon Tetrachloride	1.06E-04	5.20E-07
		Chloroform	4.21E-04	2.71E-07
		Hexachlorobenzene	1.00E-07	1.19E-08
		Hexachlorobutadiene	9.20E-07	2.43E-08
		Hexachloroethane	3.00E-07	1.85E-07
		Trichloroethylene	1.72E-05	2.79E-07
		Vinyl Chloride	8.00E-07	4.01E-07
28	2,338	1,2-Dichloroethane	4.52E-05	2.06E-07
		Benzene	1.05E-04	6.48E-07
		Methyl Ethyl Ketone	2.00E-08	1.61E-08
		Trichloroethylene	4.00E-08	4.00E-08
		Xylenes (mixed)	2.08E-06	7.43E-07
29	331	Benzene	1.29E-04	6.48E-07
30	1,590	1,1-Dichloroethylene	4.00E-08	3.71E-08
		1,2-Dichloroethane	6.00E-08	6.00E-08
		Benzene	6.02E-04	6.48E-07
		Carbon Tetrachloride	2.00E-08	1.66E-08
		Hexachloroethane	1.00E-08	5.00E-11
		Methyl Ethyl Ketone	1.00E-08	1.00E-08
		Toluene	9.00E-08	9.00E-08
		Trichloroethylene	3.20E-07	2.79E-07
		Vinyl Chloride	1.40E-07	1.38E-07
		Xylenes (mixed)	1.40E-07	1.40E-07
31	267	Benzene	6.49E-03	6.49E-07
32	3,000	Benzene	1.03E-04	6.48E-07
33	218	1,2-Dichloroethane	1.09E-05	2.06E-07
		Benzene	6.49E-03	6.49E-07
		Carbon Tetrachloride	5.15E-05	5.20E-07
		Chloroform	1.24E-05	2.71E-07
		Toluene	3.82E-03	3.82E-07
		Trichloroethylene	1.00E-07	1.25E-07
34	8,999	Benzene	4.79E-06	6.47E-07
35	23	Benzene	5.29E-04	6.58E-07
		Methyl Ethyl Ketone	8.71E-05	6.92E-07

Attachment 4: Toxicity Data for Constituents Modeled at TC Facilities

Chemicals Modeled	CAS #	RCRA CODE	RfD – Inhalation (mg/kg/day)	SF – Inhalation 1/(mg/kg/day)	UTS (mg/kg)
1,1-dichloroethylene	75354	D029	--	1.80E-01	6
1,2-dichloroethane	107062	D028	--	9.10E-02	6
1,4-dichlorobenzene	106467	D027	--	--	6
2,4,6-trichlorophenol	88062	D042	--	1.10E-02	7.4
benzene	71432	D018	--	2.90E-02	10
carbon tetrachloride	56235	D019	--	5.30E-02	6
chlordane	57749	D020	--	1.30E+00	0.26
chlorobenzene	108907	D021	6.00E-03	--	6
chloroform	67663	D022	--	8.10E-02	6
dichloroethyl ether	111444		--	1.10E+00	6
ethylbenzene	100414		2.90E-01	--	10
ethylene dibromide	106934		--	7.60E-01	15
heptachlor (and its epox)	76448	D031	--	4.50E+00	0.066
hexachlorobenzene	118741	D032	--	1.60E+00	10
hexachlorobutadiene	87683	D033	--	7.70E-02	5.6
hexachloroethane	67721	D034	--	1.40E-02	30
methyl chloroform	71556		3.00E-01	--	6
methyl ethyl ketone	78933	D035	2.90E-01	--	36
methylene chloride	75092		8.50E-01	1.60E-03	30
nickel	7440020		--	8.40E-01	100
nitrobenzene	98953	D036	6.00E-04	--	14
toluene	108883		5.70E-01	--	10
trichloroethylene	79016	D040	--	1.70E-02	6
vinyl chloride	75014	D043	--	3.00E-01	6
xylenes (mixed)	1330207		4.00E-01	--	30

Note: RfD = Reference Dose; SF = Cancer Slope Factor

Table 1. Comparison of High-end Individual Cancer Risks Between Proposed Rule and Final Rule

No.	High-end Individual Cancer Risks for				Ratio of Individual Cancer Risks Final Rule to Proposed Rule	
	Proposed Rule		Final Rule			
	Baseline	Post-Regulatory	Baseline	Post-Regulatory	Baseline	Post-Regulatory
1	1.49E-05	4.19E-07	1.07E-05	3.01E-07	0.7	0.7
2	5.81E-06	1.14E-07	4.65E-06	9.10E-08	0.8	0.8
3	1.36E-05	9.17E-07	5.59E-05	3.79E-06	4.1	4.1
4	3.63E-07	8.28E-08	8.66E-07	2.00E-07	2.4	2.4
5	9.21E-08	2.97E-08	1.07E-07	3.47E-08	1.2	1.2
6	7.37E-04	4.34E-07	5.09E-04	3.04E-07	0.7	0.7
7	9.85E-08	1.91E-08	1.76E-07	3.41E-08	1.8	1.8
8	6.90E-08	3.99E-09	1.21E-07	7.02E-09	1.8	1.8
9	7.43E-08	2.40E-08	7.02E-08	2.28E-08	0.9	1.0
10	2.15E-05	4.87E-08	3.30E-05	7.48E-08	1.5	1.5
11	5.20E-07	6.06E-08	9.28E-07	1.08E-07	1.8	1.8
12	2.42E-07	1.32E-08	2.37E-07	1.29E-08	1.0	1.0
13	5.93E-05	5.69E-06	8.59E-05	7.62E-06	1.4	1.3
14	9.28E-05	3.42E-07	2.90E-04	1.07E-06	3.1	3.1
15	3.35E-04	6.65E-07	7.21E-04	1.55E-06	2.2	2.3
16	1.11E-04	6.09E-07	6.55E-05	3.79E-07	0.6	0.6
17	2.15E-03	9.47E-07	5.50E-03	2.40E-06	2.6	2.5
18	2.77E-05	3.28E-07	2.33E-05	2.78E-07	0.8	0.8
19	1.49E-05	1.10E-07	8.80E-05	6.33E-07	5.9	5.8
20	5.19E-06	1.65E-07	2.28E-05	7.22E-07	4.4	4.4
21	7.58E-09	7.11E-10	9.83E-09	9.23E-10	1.3	1.3
22	2.82E-04	7.63E-08	3.43E-04	9.26E-08	1.2	1.2
23	1.30E-06	1.49E-08	1.42E-06	1.60E-08	1.1	1.1
24	1.29E-04	4.03E-07	5.20E-05	3.39E-07	0.4	0.8
25	1.35E-04	7.29E-07	1.10E-04	5.99E-07	0.8	0.8
26	9.99E-06	5.04E-08	2.13E-05	1.07E-07	2.1	2.1
27	2.26E-04	1.07E-06	3.60E-04	1.63E-06	1.6	1.5
28	4.07E-04	4.07E-08	7.86E-04	7.87E-08	1.9	1.9
29	5.16E-05	3.24E-07	2.52E-04	1.59E-06	4.9	4.9
30	3.40E-04	1.57E-07	2.86E-04	1.32E-07	0.8	0.8
31	2.80E-06	3.48E-09	4.90E-06	6.12E-09	1.8	1.8
				Average =	1.86	1.87

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Table 2. Comparison of High-end Individual Noncancer Risks Between Proposed Rule and Final Rule

No.	High-end Individual Noncancer Risks for				Ratio of Individual Noncancer Risks Final Rule to Proposed Rule	
	Proposed Rule		Final Rule			
	Baseline	Post-Regulatory	Baseline	Post-Regulatory	Baseline	Post-Regulatory
1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
2	3.15E-04	3.15E-04	2.22E-05	4.47E-05	0.1	0.1
3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
4	3.95E-02	1.18E-03	1.22E-02	3.22E-04	0.3	0.3
5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
13	6.13E+01	7.31E-03	1.18E+01	9.64E-04	0.2	0.1
14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
15	3.43E-04	1.11E-04	1.04E-04	3.36E-05	0.3	0.3
16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
17	8.58E-04	4.27E-04	2.80E-04	1.42E-04	0.3	0.3
18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
19	3.53E-02	8.39E-05	2.67E-02	6.18E-05	0.8	0.7
20	7.82E-03	6.22E-04	4.37E-03	3.12E-04	0.6	0.5
21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
23	2.93E-03	2.22E-05	4.11E-04	2.95E-06	0.1	0.1
24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
25	7.73E-04	3.09E-04	8.08E-05	2.96E-05	0.1	0.1
26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
27	5.51E-05	5.51E-05	1.11E-05	1.11E-05	0.2	0.2
28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0	1.0
30	9.17E-02	9.17E-06	9.93E-03	9.86E-07	0.1	0.1
31	4.26E-04	3.38E-06	9.59E-05	7.59E-07	0.2	0.2
				Average =	0.72	0.72

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Table 3. Comparison of Population Cancer Cases Between Proposed Rule and Final Rule

	Lifetime Cancer Cases for				Ratio of Lifetime Cancer Cases Final Rule to Proposed Rule	
	Proposed Rule		Final Rule			
No.	Baseline	Post-Regulatory	Baseline	Post-Regulatory	Baseline	Post-Regulatory
1	5.43E-04	1.53E-05	2.10E-03	5.93E-05	3.9	3.9
2	2.12E-04	4.15E-06	2.72E-03	5.32E-05	12.8	12.8
3	1.21E-03	8.19E-05	5.01E-02	3.40E-03	41.4	41.5
4	1.32E-05	3.02E-06	5.89E-04	1.36E-04	44.6	45.0
5	3.35E-06	1.08E-06	7.36E-05	2.38E-05	22.0	22.0
6	2.68E-02	1.58E-05	2.85E-01	1.77E-04	10.6	11.2
7	3.58E-06	6.95E-07	1.09E-04	2.11E-05	30.4	30.4
8	2.51E-06	1.45E-07	4.79E-05	2.77E-06	19.1	19.1
9	2.70E-06	8.73E-07	3.78E-04	1.23E-04	140.0	140.9
10	7.84E-04	1.77E-06	2.31E-02	5.23E-05	29.5	29.5
11	1.89E-05	2.20E-06	4.28E-05	5.00E-06	2.3	2.3
12	8.81E-06	4.80E-07	5.52E-05	3.02E-06	6.3	6.3
13	2.70E-03	2.59E-04	3.25E-02	2.88E-03	12.0	11.1
14	3.38E-03	1.25E-05	3.47E-02	1.27E-04	10.3	10.2
15	1.22E-02	2.42E-05	3.90E-03	8.38E-06	0.3	0.3
16	4.05E-03	2.22E-05	3.30E-02	1.91E-04	8.1	8.6
17	7.84E-02	3.45E-05	8.33E-01	3.63E-04	10.6	10.5
18	1.01E-03	1.19E-05	3.12E-02	3.70E-04	30.9	31.1
19	5.43E-04	3.99E-06	7.94E-04	5.71E-06	1.5	1.4
20	1.89E-04	6.02E-06	1.91E-03	6.06E-05	10.1	10.1
21	2.76E-07	2.59E-08	1.76E-06	1.65E-07	6.4	6.4
22	1.03E-02	2.78E-06	5.53E-02	1.50E-05	5.4	5.4
23	4.72E-05	5.41E-07	1.35E-03	1.52E-05	28.6	28.1
24	4.70E-03	1.47E-05	1.92E-02	1.26E-04	4.1	8.6
25	4.92E-03	2.65E-05	8.21E-02	4.47E-04	16.7	16.9
26	3.64E-04	1.83E-06	2.62E-04	1.32E-06	0.7	0.7
27	8.22E-03	3.88E-05	2.95E-02	1.34E-04	3.6	3.5
28	1.48E-02	1.48E-06	3.45E-02	3.46E-06	2.3	2.3
29	2.35E-03	1.48E-05	2.69E-02	1.70E-04	11.4	11.5
30	1.24E-02	5.73E-06	2.37E-01	1.10E-04	19.1	19.2
31	1.02E-04	1.27E-07	2.28E-03	2.84E-06	22.4	22.4
Annual Cancer Cases in Sample:	2.72E-03	8.70E-06	2.61E-02	1.30E-04		
Annual Cancer Cases in Universe:	3.81E-03	1.22E-05	3.65E-02	1.82E-04		

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Table 4: Comparison of Population Exposed over RfD Between Proposed Rule and Final Rule

No.	Population Exposed over RfD				Ratio of Final Rule:Proposed Rule	
	Proposed Rule		Final Rule			
	Baseline	Post-Regulatory	Baseline	Post-Regulatory	Baseline	Post-Regulatory
1	0	0	0	0	1.0	1.0
2	0	0	0	0	1.0	1.0
3	0	0	0	0	1.0	1.0
4	0	0	0	0	1.0	1.0
5	0	0	0	0	1.0	1.0
6	0	0	0	0	1.0	1.0
7	0	0	0	0	1.0	1.0
8	0	0	0	0	1.0	1.0
9	0	0	0	0	1.0	1.0
10	0	0	0	0	1.0	1.0
11	0	0	0	0	1.0	1.0
12	0	0	0	0	1.0	1.0
13	4,700	0	768	0	0.2	1.0
14	0	0	0	0	1.0	1.0
15	0	0	0	0	1.0	1.0
16	0	0	0	0	1.0	1.0
17	0	0	0	0	1.0	1.0
18	0	0	0	0	1.0	1.0
19	0	0	0	0	1.0	1.0
20	0	0	0	0	1.0	1.0
21	0	0	0	0	1.0	1.0
22	0	0	0	0	1.0	1.0
23	0	0	0	0	1.0	1.0
24	0	0	0	0	1.0	1.0
25	0	0	0	0	1.0	1.0
26	0	0	0	0	1.0	1.0
27	0	0	0	0	1.0	1.0
28	0	0	0	0	1.0	1.0
29	0	0	0	0	1.0	1.0
30	0	0	0	0	1.0	1.0
31	0	0	0	0	1.0	1.0
				Average =	0.97	1.00

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APPENDIX I
Waste Minimization Commercial TSD Analysis

The data in the spreadsheet were sorted by industry and 1995 quantity. The commercial TSDs associated with the 15 lines with the largest 1995 quantity were then analyzed in the TCDMS according to their potential for waste minimization.

One TSD reported receiving a sporadically generated 17,865 ton wastestream from a chemical company with no waste description. Based on available physical information (75 percent solids, 5 percent water, and 20 percent oil and grease values reported in TCDMS) the waste minimization potential for this wastestream cannot be determined.

Another TSD reported receiving a routinely generated 13,351 ton primary wastewater treatment sludge from an unknown facility containing vinyl chloride left over from the conversion to polyvinyl chloride. The only physical chemical data reported in TCDMS was a TOC (total organic carbon) value of 15 percent and an EOX (extractable organic halide) value of 640 ppm. The generating facility may have significant waste minimization potential. However, the available information is insufficient to quantify any savings.

A third TSD reported receiving three routinely generated wastestreams totaling 25,350 tons from a hazardous waste incinerator described as incinerator ash. Waste codes D018, D022, D019, D021, D020, and D023 are associated with these wastestreams. The waste minimization potential at a well operated hazardous waste incinerator is minimal. Last minute changes to the cost analysis data eliminated this wastestream from the Phase II rule cost analysis because listed waste codes were combined with TC codes in these streams.

This third TSD also reported receiving a routinely generated 3,670 ton wastestream from a petroleum refinery described as an oil/water separator sludge with benzene and polymers. No physical chemical property data was reported. However, a note was made that the polymers affect the treatability of this wastestream. This wastestream has significant potential for waste minimization; however, the available information is insufficient to establish a case study to quantify the savings.

A fourth TSD reported receiving a routinely generated 10,222 ton wastestream from a hazardous waste treatment facility described as "CHEM PAC, treatment of hazardous and nonhazardous wastes." Because this waste appears to be a residual from waste treatment operations, waste minimization potential is minimal.

These seven wastestreams account for 72 percent of the routinely generated, and 80 percent of the sporadically generated, nonwastewater waste reported as received by TSDs.

An evaluation of the debris received by TSDs was attempted. Two TSDs account for 19,410 tons or 81.6 percent of the debris reported. One hazardous waste landfill reports wastestream number 1 as 9,245 tons. However, in the TCDMS no waste descriptions are provide for any

wastestreams and no wastestream number 1 is reported. Another hazardous waste landfill accounts for the remaining 10,165 tons. However, no wastestreams are present in TCDMS for survey number 2.

APPENDIX J
Summary of Waste Minimization Analysis Telephone Contacts

Presented below are the results of telephone contacts made as a follow-up to the Toxicity Characteristic (TC) waste survey conducted in 1992. Sixteen facilities were contacted for information on waste management activities for newly listed TC waste subject to EPA's Phase II rule-making. Exhibit J-1 presents the protocol for the telephone contacts.

Chemical Company A - This facility indicated that it manages the following nonwastewater waste streams affected by the TC rule: lube oil sludge; several liquid, solid, and byproduct streams, and dirt contaminated with TC organics, i.e., D018. Waste minimization activities were being conducted on several of the liquid and sludge byproduct streams. The waste minimization activities consist of recycling two liquid TC wastes in one plant that would otherwise be incinerated. The facility also removed one piece of equipment that generated a TC sludge that was previously incinerated. The facility reported that approximately 1,050 tons of waste were reduced as a result of waste minimization efforts. The facility stated that it saved approximately $215,000 ($205/ton) in 1993 by employing waste minimization on its waste streams.

Chemical Company A indicated that economic considerations were the overriding impetus for waste minimization activities. The TC rule did play a minor role in driving the waste minimization activities.

Petroleum Refinery A - This facility indicated that its crude tank bottoms (D018) are affected by the TC rule. The major thrust of the waste minimization activities consists of source control. Other efforts involve putting the crude tank bottoms through a centrifuge and extracting the benzene and recycling it back to the refinery. A lime sludge (D018) is generated that is dewatered and sent to a cement kiln as raw material substitute. The facility pays the kiln to accept the waste and the waste's the transportation costs. The facility estimates that 12,000 tons of lime sludge are reduced at the plant (the major portion due to source control). Shell estimates that the economic benefit due to waste minimization is $250,000 per year.

Petroleum Refinery A indicated that the waste minimization efforts are strictly driven by economics which is in turn driven by the TC rule that requires treatment of hazardous wastes to LDR standards.

Petroleum Refinery B - This facility reported managing D018 streams that included catalysts (160 tons/1993), tank bottoms (206 tons/1993), and activated carbon (13 tons/1993). However, none of these waste streams were reported on the 1992 survey. The facility reported that it found it difficult to employ waste minimization on these wastes. D018 catalysts and activated carbon are sent to offsite regeneration. However, the facility anticipated that the Phase II LDR standards would make the vendors less likely to accept these materials.

The facility cited the Phase II LDR treatment standards as being the driving force behind its waste minimization plans.

Chemical Company B - This facility managed a D028 waste stream. Waste minimization activities have been instituted since 1988. These include process changes and segregation of nonhazardous and hazardous waste streams. The D028 generation in 1993 was 2,600 tons versus 5,550 tons in

1988 for an annual cost savings of $304,000 (or about $100 per ton). Current plans include an additional reduction of 80 percent by 1999 for an estimated future cost savings of $1,125,000 (or about $500 per ton).

The facility stated that its primary reason for employing waste minimization activities were economic, such as for product recovery, rather than the Phase II rule itself.

Petroleum Refinery C - This facility indicated that several of its waste streams are affected by the TC rule. These waste streams are: butamen catalyst (D018); benzene organic sludge from tank cleaning operations; butamen drier catalyst from alkylation of crude oil in gasoline refining; benzene organic sludge from tank cleaning operations (600 tons); and, DAF and API sludge (2,400 tons). Of these waste streams, the benzene sludge was land farmed (this activity is suspended until a permit is granted), and the DAF and API sludge is used as raw materials in the coker feed. The estimated economic benefit from the land farming of the D018 benzene sludge was $570/ton. An additional savings of $600/ton for the DAF and API sludge is realized using these materials as feedstock for the coker rather than disposing of these materials as wastes.

Chemical Company C - This facility indicated that its wastes affected by the TC rule were catalysts. By employing offsite regeneration, it eliminated this waste stream in 1993, a reduction of 270 tons. However, this waste stream is not part of the 1992 survey information.

The facility cited the Phase II LDR treatment standards as being the driving force behind its waste minimization plans.

Petroleum Refinery D - This facility indicated its D018 wastestream as tank bottoms. Waste minimization activities attempted on these wastes have not been successful.

Petroleum Refinery E - This facility reported the following D018 wastestreams: catalysts, tank bottoms, and vessel sludges. No waste minimization activities have been attempted.

Petroleum Refinery F - EPA was unable to make contact with the appropriate person at the facility.

Petroleum Refinery G - EPA was unable to make contact with the appropriate person at the facility.

Petroleum Refinery H - EPA was unable to make contact with the appropriate person at the facility.

Chemical Company D - This facility did not return any of our phone messages.

Chemical Company E - This facility indicated that it does not manage any newly identified TC nonwastewater streams.

Chemical Company F - This facility indicated that sludges from tank cleaning operations could carry some of the new TC waste codes. The facility employs good operating practices in its tank cleaning operations. The facility also indicated that it uses a centrifuge to minimize the amount of sludge generated (estimated 75 percent reduction).

Petroleum Refinery I - This facility did not return any of our phone messages.

Petroleum Refinery J - This facility did not return any of our phone messages.

EXHIBIT J-1
TELEPHONE CONTACT PROTOCOL

Facility:_____ Contact:_____
Phone No.:_____

Under contract to the U.S. EPA, we are assisting EPA with development of the final Regulatory Impact Analysis for the TC wastes Phase 2 rule-making. I am calling as a follow-up to the TC waste survey conducted in 1992. Do you have time to answer a few questions?

What nonwastewater waste streams does your facility manage that are affected by the TC rule?

On which of these nonwastewater streams are you employing waste minimization activities?

Were these waste minimization activities employed as a direct result of the TC rule or were other factors involved?

What waste minimization activities are you undertaking/plan to undertake?

What is the amount/quantity of reduction (tons/gallons) of waste due to waste minimization?

Did you previously produce waste that, due to waste minimization, you no longer produce or have realized a significant volume reduction?

Can we ask/phone back concerning the economic benefit derived from waste minimization?

APPENDIX K

Sensitivity Analysis of Ground-Water Population Risk Assumptions

This appendix details the sensitivity analysis performed on the radius used for the ground-water benefits analysis. The DAF used in the analysis was first developed for the TC Rule RIA and considered only those drinking water wells within one mile of a facility. For the Phase II LDR RIA, the DAF distribution was applied to wells within two miles of a facility. The DAF was not mathematically corrected to extend from the one mile distance used in the TC analysis to the two miles used for this rule. Therefore, EPA performed a sensitivity analysis reanalyzing the groundwater risk, considering only wells within a one-mile radius. This appendix is organized into two sections: the first explains the approach and the second presents the results of the analysis.

Approach

As is explained in Step 6 of Section 5.1.1 of the RIA, EPA estimated exposed populations by (1) determining the number of people exposed to contaminated ground-water via wells located within two miles of facilities from the corrective action RIA sample, (2) using these numbers, along with population density values for the corrective action sample facilities, to calculate ratios of total to exposed populations, and (3) applying these ratios to the Phase II sample facilities.

EPA tested the sensitivity of the radius used to calculate exposed populations by determining the number of people exposed to contaminated ground water via wells located within one mile of facilities from the corrective action RIA sample. As a result of this change, the total-to-exposed-population ratios also changed. The base analysis assumed that, for low-density settings, 0.4 times the total population in the 90 degree, two-mile sector would be exposed, and that 0.05 times the total population would be exposed in high-density settings.

Using estimates based on a one-mile radius, EPA calculated that, for low-density settings, 1.4 times the total population in the 90 degree, one-mile sector would be exposed, and that 0.1 times the total population would be exposed in high-density settings. The seemingly counter-intuitive ratio for the low-density scenario (i.e., the exposed population is greater than the total population) is caused by the effects of a large public supply well that is located within one mile of one of the corrective action sample facilities. Under the two-mile approach, 10 of the 37 low-density facilities had ground-water exposures, totalling 57,210 exposed people out of a total population in the two-mile sectors of 91,240 people. Furthermore, of the 57,210 exposures, 52,500 were associated with a public well at one facility. Under the one-mile scenario, nine of the facilities have exposures, totalling 56,780 people. As with the two-mile scenario, this total is dominated by exposures from the same single facility. The total population under the one-mile scenario, however, is only 22,810 (i.e., one-fourth of the two-mile scenario because the same densities are assumed). Because the decrease of total exposed population is much less that the decrease in the total potential population, the ratio is increased such that it exceeds unity. Note that the final ratios used in the analysis represent the average of the facility-specific ratios, rather that the ratio of the total exposed population to the total potential population. However, looking at the totals helps to explain the general trend.

Using these revised ratios, the Agency estimated total exposed populations for each of the Phase II sample facilities. Note that while the ratios increase, the total affected populations decrease because, assuming a uniform population density, the total population within one mile is only one-fourth of the total population within two miles.

Results

Under the base approach (as was shown in RIA Exhibit 5-8), the rule reduces 0.22 cancer cases per year with respect to the central tendency baseline or, in other words, 92 percent of the baseline cancer cases. For non-cancer effects (as was shown in RIA Exhibit 5-9) two of the 36 facilities had exposures above threshold doses, totalling 2,038 exposed people.

The results of the sensitivity analysis indicate that, under the one-mile approach, the rule reduces 0.18 cancer cases per year with respect to the central tendency baseline or, in other words, 91 percent of the baseline cancer cases. For non-cancer effects the same two facilities had exposures above threshold doses, now totalling 1,136 exposed people.