

FINAL NESHAP STANDARDS FOR WASTE OPERATIONS:
BASIS FOR IMPACT CALCULATIONS

Prepared for

Chemicals and Petroleum Branch
Emission Standards Division
Office of Air Quality Planning Standards
United States Environmental Protection Agency

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1. INTRODUCTION

This document presents the basis for the revised estimates of impacts associated with the control of benzene emissions from waste operations at petroleum refineries; coke by-product recovery plants; off-site treatment, storage and disposal facilities; and chemical plants. The estimates of impacts presented at proposal were revised and updated to quantify some of the uncertainties identified at proposal. The only revision required as a result of a change in the proposed standard was to include only benzene in aqueous wastes (wastes with 10 percent or more water) in the calculation of the 10 Mg/yr benzene cutoff. The major revisions focused on the following areas:

1. Identification of facilities with benzene wastes.
2. Estimates of the number of waste streams and total quantity of waste containing benzene.
3. The emission modeling approach, especially the wastewater collection system and oil-water separators.
4. Accounting for benzene losses prior to the point for which benzene concentration data were reported.
5. Cost estimates.
6. Providing a range of emission estimates.
7. Updating the estimates of risk and incidence.
8. Performing a more detailed analysis of a few specific sites.

Although these revised impacts are based in part on additional information, some of which was supplied by commenters on the proposed rule, many of the uncertainties discussed at proposal still exist. These uncertainties arise from incomplete site-specific data on waste

quantities, benzene concentrations at the point of generation, and waste management processes. However, this analysis provides a range of emission estimates for specific facilities based on reported ranges of benzene concentration, and also examines the upper and lower bounds of the uncertainties in the emission estimates for some specific sites. The emission estimates presented in this analysis are current best estimates, but the ranges of estimates do not represent the full range of possible variations. Because of unknown site-specific factors, the actual emissions from a given facility may be higher or lower than the estimates presented here for that facility.

2. PETROLEUM REFINERIES

2.1 Major Wastes with Benzene

The approach for estimating benzene emissions from wastes at petroleum refineries focused on those major waste streams most likely to contain benzene. A total of 13 wastewater streams associated with specific processes was identified based on comments provided by the American Petroleum Institute (API)¹ and on engineering judgements as to which refinery processes are the most likely to contain benzene. These processes are listed in Table 2-1 with a typical generation factor in terms of gallons of wastewater per barrel of process capacity. Capacity data for the different processes were obtained for 187 petroleum refineries operating in 1989 from the Oil and Gas Journal.² For each of these petroleum refineries, an estimate of the quantity of each wastewater stream produced was obtained by multiplying the site-specific capacity data by the generation factors given in Table 2-1. Additional

TABLE 2-1. MAJOR WASTEWATER STREAMS THAT CONTAIN BENZENE AT PETROLEUM REFINERIES

Process	Wastewater Source(s)	Rate ^a (gal/B)	Reference	Capacity Basis ^b
1. Crude storage	Residual water in crude	2.0	3	crude oil
2. Desalting	Water washing	0.002	3	crude oil
3. Atmospheric distillation	Condensed stripping steam from overhead accumulator	0.3	3	crude oil
4. Gas processing	Caustic and water wash	0.08	3	crude oil
5. Catalytic reforming	Condensed stripping steam from overhead accumulator	0.22	3	catalytic reforming
6. Catalytic cracker	Overhead accumulators and steam strippers on the fractionator, catalyst regeneration	1.1	3	catalytic cracking
7. Visbreaking	Accumulator on the fractionator	0.06-0.3	c	visbreaking
8. Coking	Contact process water and steam overhead accumulators	3.1	3	delayed coking
9. Naphtha sweetening	Water washers, caustic washer, spent caustic	0.06	4	catalytic hydrotreating
10. Light product storage	Water draw from the storage tank	0.02-0.2	d	40% to 50% of crude ^e
11. Light product storage	Sludges from the tank	0.02-0.2	d	40% to 50% of crude ^e
12. Slop oil tanks	Water draws from the bottom of the slop oil tank	0.2-2	f	0.05 to 0.6% of crude ^g
13. Benzene production	Wastewater from BTX and benzene production	2	4	BTX and hydrodealkylation

- a Generation rate in gallons per barrel of capacity for wastewater discharged directly to the sewer.
- b The process for which site-specific capacity data from the Oil and Gas Journal² were used to estimate wastewater quantity.
- c This wastewater is from accumulator on the fractionator. Similar sources include atmospheric distillation (0.3 gal/B) and naphtha hydrodesulfurization (0.08 gal/B).
- d Assume 1 to 10 percent of that from crude storage.
- e From Reference 5, gasoline averages 42 percent of crude oil. Use a range of 40 to 50 percent.
- f Assume 10 to 100 percent of that from crude storage.
- g Based on 15 gallons of wastewater per barrel of crude (Reference 4) and 0.1 to 1 percent oil in the wastewater (Reference 6).

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details on the capacity data and quantity of major wastewater streams that contain benzene are given for each refinery in Appendix A.

A range of benzene concentrations was developed for each wastewater stream to place reasonable bounds on possible concentrations. The concentration ranges are presented in Table 2-2 and are based on the expected benzene concentration in the processes, an oil content in the wastewater of 0.1 to 1 percent⁶, and the partitioning of benzene between the oil:water of 80 to 100:1.⁷ For example, the typical concentrations of benzene in crude oil are given in Table 2-3 and show a range of 700 to 1900 ppm with most at the upper end of the range. These data were used to estimate the benzene concentration in water separated from crude oil in storage. For the lower end of the range, the partitioning of benzene between the crude oil and water was estimated as 100:1, and 0.1 percent oil was estimated to be entrained in the water:

$$\text{concentration in water} = 700 \text{ ppm}/100 = 7 \text{ ppm}$$

$$\text{concentration in oil} = 700 \text{ ppm}$$

$$\begin{aligned} \text{concentration in wastewater with 0.1 percent oil} = \\ (0.001) \times 700 + (0.999) \times 7 = 8 \text{ ppm.} \end{aligned}$$

For the upper end of the range, the concentration of benzene in the crude oil was estimated as 1,900 ppm, the partitioning was 80:1, and the water was estimated to contain 1 percent oil:

$$\text{concentration in water} = 1,900 \text{ ppm}/80 = 24 \text{ ppm}$$

$$\text{concentration in oil} = 1,900 \text{ ppm}$$

$$\begin{aligned} \text{concentration in wastewater with 1 percent oil} = \\ (0.01) \times 1,900 + (0.999) \times 24 = 43 \text{ ppm.} \end{aligned}$$

TABLE 2-2. RANGES OF BENZENE CONCENTRATION FOR MAJOR WASTEWATER STREAMS

<u>Process Source</u>	<u>Benzene Concentration (ppm)</u>
1. Crude storage	8 - 43 ^a
2. Desalting	8 - 43
3. Atmospheric distillation	13 - 320 ^b
4. Gas processing	13 - 320
5. Catalytic reforming	500 - 630 ^c
6. Catalytic cracking	13 - 320
7. Visbreaking	13 - 320
8. Coking	13 - 320
9. Naphtha sweetening	13 - 320
10. Light product storage (water)	13 - 320
11. Light product storage (sludge)	13 - 320
12. Slop oil tanks	8 - 43
13. Benzene production	180 - 1,800 ^d

^a Based on 700 to 1,900 ppm benzene in crude oil, 0.1 to 1 percent oil in the water, and benzene partitioning into oil:water of 80 to 100:1.

^b Benzene in gasoline ranges from 0.12 to 1.4 percent, most around 1 percent from Reference 8. Assume 0.1 to 1 percent gasoline with wastewater and partitioning of 80 to 100:1. (Other sources indicate that the current trend is toward higher concentrations of benzene in gasoline; consequently, the upper end of the range is probably more applicable.)

^c Based on the reformer product containing 5 percent benzene and partitioning of 80 to 100:1.

^d Assume that wastewater from contact with BTX or benzene ranges from 10 to 100 percent of saturation (1,800 ppm).

TABLE 2-3. BENZENE CONCENTRATION IN CRUDE OIL⁸

<u>Type</u>	<u>Benzene Concentration (ppm)</u>
Louisiana Gulf	1,500
West Texas	1,800
Venezuelan	1,500
Libyan	700
Nigerian	1,100
Iranian	1,900

A similar approach was used for other benzene wastewaters and the details are given in the footnotes to Table 2-2. If emulsification or other separation problems occur, the concentration of oil in the oily wastewater may be greater than 1 percent, and the benzene concentration in the oily wastewater could exceed the upper bound estimate presented in Table 2-2.

Sludges that contain benzene are also generated at petroleum refineries. For this analysis, data for sludges with specific RCRA waste codes were used from the 1987 survey of hazardous waste generators.¹⁰ These wastes include float from dissolved-air flotation (DAF) units (K048), slop oil solids (K049), heat exchanger sludge (K050), API separator sludge (K051), and leaded tank bottom (K050). A typical generation rate for these sludges was derived by taking the waste quantity data from the survey of hazardous waste generators (shown in Table 2-4) for specific facilities and dividing this quantity by the facility's crude oil capacity. From these results shown in Table 2-4, a median value was chosen for the generation factor. The generation factor was multiplied by site-specific capacity data to estimate the quantity of these sludges generated at each of the 187 petroleum refineries. Typical ranges for the concentration of benzene in these sludges are also shown in Table 2-4 and were derived from the concentrations reported from the generator's survey (Table A-4 in Appendix A).

2.2 Emission Estimates

The primary source for emission estimates for wastewater treatment systems is the Control Technology Center (CTC) document "Industrial

TABLE 2-4. GENERATION FACTORS FOR RCRA HAZARDOUS WASTES AT PETROLEUM REFINERIES

FACILITY	CITY	STATE	CRUDE OIL CAPACITY (BPD)*	RCRA CODE	WASTE QUANTITY (Mg/yr)	GENERATION FACTOR (Mg/yr/BPD)
DAF FLOAT (1 to 100 ppm benzene):						
FINA OIL & CHEMICAL	PORT ARTHUR	TX	1.00E+05	K048	2.2E+04	2.2E-01
LION OIL	EL DORADO	AR	4.80E+04	K048	1.8E+03	3.7E-02
CONOCO LANDFARM	BILLINGS	MT	4.85E+04	K048	1.1E+03	2.3E-02
HUNT REFINING	TUSCALOOSA	AL	4.45E+04	K048	9.8E+02	2.2E-02
HUNT REFINING	TUSCALOOSA	AL	4.45E+04	K048	7.8E+02	1.8E-02
MARATHON PETROLEUM	ROBINSON	IL	1.95E+05	K048	3.4E+03	1.7E-02
QUAKER STATE REFINING	EMLENTON	PA	6.50E+03	K048	9.2E+01	1.4E-02
CHEVRON REFINERY	PERTH AMBOY	NJ	8.00E+04	K048	1.0E+03	1.3E-02
CHEVRON	EL PASO	TX	6.60E+04	K048	5.1E+02	7.7E-03
ATLANTIC REFINING	PHILADELPHIA	PA	1.25E+05	K048	9.0E+02	7.2E-03 **
QUAKER STATE REFINING	EMLENTON	PA	6.50E+03	K048	4.6E+01	7.1E-03
AMOCO OIL LANDFARM	TEXAS CITY	TX	4.20E+05	K048	2.8E+03	6.6E-03
MARATHON PETROLEUM	GARYVILLE	LA	2.55E+05	K048	1.6E+03	6.2E-03
SHELL OIL	DEER PARK	TX	2.16E+05	K048	1.1E+03	5.3E-03
MONTANA REFINING CO.	BLACK EAGLE	MT	6.30E+03	K048	3.1E+01	4.9E-03
CHEVRON	SALT LAKE CITY	UT	4.50E+04	K048	1.2E+02	2.7E-03
CITGO PETROLEUM	LAKE CHARLES	LA	3.20E+05	K048	8.2E+02	2.6E-03
CROSS OIL & REFINING	SMACKOVER	AR	6.77E+03	K048	7.3E+00	1.1E-03
SHELL OIL	DEER PARK	TX	2.16E+05	K048	1.5E+02	6.9E-04
SINCLAIR OIL	SINCLAIR	WY	5.40E+04	K048	1.8E+00	3.4E-05
SLOP OIL SOLIDS (1 to 100 ppm benzene):						
SUN REFINING	TULSA	OK	8.50E+04	K049	3.9E+04	4.6E-01
CHEVRON	PHILADELPHIA	PA	1.74E+05	K049	2.4E+03	1.4E-02
MARATHON PETROLEUM	ROBINSON	IL	1.95E+05	K049	2.0E+03	1.0E-02
MARATHON PETROLEUM	GARYVILLE	LA	2.55E+05	K049	1.9E+03	7.4E-03
CITGO PETROLEUM	LAKE CHARLES	LA	3.20E+05	K049	2.0E+03	6.4E-03
SWEENEY REFINERY	OLD OCEAN	TX	1.75E+05	K049	9.9E+02	5.7E-03 **
FINA OIL	BIG SPRING	TX	5.50E+04	K049	2.5E+02	4.5E-03
STANDARD OIL	OREGON	OH	1.71E+05	K049	5.1E+02	3.0E-03
AMOCO OIL REFINERY	YORKTOWN	VA	5.10E+04	K049	1.5E+02	3.0E-03
ATLANTIC REFINING	PHILADELPHIA	PA	1.25E+05	K049	1.0E+02	8.3E-04
FRONTIER OIL	CHEYENNE	WY	3.50E+04	K049	8.2E+00	2.3E-04
HEAT EXCHANGER SLUDGE (10 to 100 ppm benzene):						
QUAKER STATE REFINING	EMLENTON	PA	6.50E+03	K050	5.4E+05	8.3E+01
FRONTIER OIL	CHEYENNE	WY	3.50E+04	K050	1.4E+03	3.9E-02
CHEVRON	EL PASO	TX	6.60E+04	K050	1.9E+01	2.9E-04
CHEVRON	PORT ARTHUR	TX	3.29E+05	K050	4.9E+01	1.5E-04
AMOCO OIL REFINERY	YORKTOWN	VA	5.10E+04	K050	4.5E+00	8.9E-05
SHELL OIL REFINERY	ROXANA	IL	2.74E+05	K050	2.3E+01	8.3E-05 **
SINCLAIR OIL	SINCLAIR	WY	5.40E+04	K050	3.6E+00	6.7E-05
SHELL OIL	ANACORTES	WA	8.40E+04	K050	3.6E+00	4.3E-05
AMOCO OIL LANDFARM	TEXAS CITY	TX	4.20E+05	K050	8.2E+00	1.9E-05
CHEVRON	PASCAGOULA	MS	2.95E+05	K050	3.6E+00	1.2E-05
CHEVRON	PORT ARTHUR	TX	3.29E+05	K050	9.1E-01	2.8E-06

TABLE 2-4. GENERATION FACTORS FOR RCRA HAZARDOUS WASTES AT PETROLEUM REFINERIES
(continued)

FACILITY	CITY	STATE	CRUDE OIL CAPACITY (BPD)*	RCRA CODE	WASTE QUANTITY (Mg/yr)	GENERATION FACTOR (Mg/yr/BPD)
API SEPARATOR SLUDGE (1 to 100 ppm benzene):						
FRONTIER OIL	CHEYENNE	WY	3.50E+04	K051	4.3E+03	1.2E-01
SHELL OIL REFINERY	ROXANA	IL	2.74E+05	K051	1.6E+04	6.0E-02
SHELL OIL	ANACORTES	WA	8.40E+04	K051	1.6E+03	1.9E-02
QUAKER STATE REFINING	EMLENTON	PA	6.50E+03	K051	9.2E+01	1.4E-02
ARCO PETROLEUM	FERNDALE	WA	1.62E+05	K051	2.1E+03	1.3E-02
PHILLIPS 66 REFINERY	BORGER	TX	1.05E+05	K051	1.1E+03	1.1E-02
LION OIL	EL DORADO	AR	4.80E+04	K051	4.9E+02	1.0E-02
SHELL OIL REFINERY	ODESSA	TX	2.86E+04	K051	2.6E+02	9.2E-03
PHILLIPS 66	WOODS CROSS	UT	2.50E+04	K051	2.3E+02	9.1E-03
SHELL OIL	MARTINEZ	CA	1.40E+05	K051	1.2E+03	8.7E-03
AMOCO OIL REFINERY	YORKTOWN	VA	5.10E+04	K051	3.6E+02	7.1E-03
CHEVRON	PASCAGOULA	MS	2.95E+05	K051	2.1E+03	7.0E-03
AMOCO OIL LANDFARM	TEXAS CITY	TX	4.20E+05	K051	2.5E+03	5.9E-03
CONOCO LANDFARM	BILLINGS	MT	4.85E+04	K051	2.0E+02	4.1E-03
CONOCO REFINERY	BILLINGS	MT	4.85E+04	K051	2.0E+02	4.1E-03
SINCLAIR OIL	TULSA	OK	8.50E+04	K051	2.5E+02	3.0E-03
CHEVRON	SALT LAKE CITY	UT	4.50E+04	K051	1.3E+02	2.8E-03
MARATHON PETROLEUM	GARYVILLE	LA	2.55E+05	K051	6.3E+02	2.5E-03 **
MARATHON PETROLEUM	ROBINSON	IL	1.95E+05	K051	3.2E+02	1.6E-03
CHEVRON	PORT ARTHUR	TX	3.29E+05	K051	5.1E+02	1.6E-03
KOCH REFINING	ROSEMOUNT	MN	2.19E+05	K051	3.1E+02	1.4E-03
CRYSEN REFINING	WOODS CROSS	UT	1.25E+04	K051	1.7E+01	1.4E-03
MONTANA REFINING CO.	BLACK EAGLE	MT	6.30E+03	K051	6.4E+00	1.0E-03
ATLANTIC REFINING	PHILADELPHIA	PA	1.25E+05	K051	1.2E+02	9.5E-04
CALCASIEU REFINING	LAKE CHARLES	LA	1.20E+04	K051	1.1E+01	9.1E-04
CHEVRON	EL PASO	TX	6.60E+04	K051	5.8E+01	8.8E-04
CITGO PETROLEUM	LAKE CHARLES	LA	3.20E+05	K051	2.2E+02	6.9E-04
COASTAL EAGLE PT.	WESTVILLE	NJ	1.09E+05	K051	4.2E+01	3.8E-04
MOBIL OIL	FERNDALE	WA	7.70E+04	K051	2.9E+01	3.8E-04
CHEVRON REFINERY	PERTH AMBOY	NJ	8.00E+04	K051	3.0E+01	3.7E-04
TESARO ALASKA PETROLEUM	KENAI	AK	7.20E+04	K051	1.4E+01	1.9E-04
SINCLAIR OIL	SINCLAIR	WY	5.40E+04	K051	7.3E+00	1.3E-04
CROSS OIL & REFINING	SMACKOVER	AR	6.77E+03	K051	9.1E-01	1.3E-04
SUN REFINING	TULSA	OK	8.50E+04	K051	1.1E+01	1.3E-04
CHEVRON REFINERY	EWA BEACH	HI	4.80E+04	K051	1.8E+00	3.8E-05
LEADED TANK BOTTOMS SLUDGE (10 to 1,000 ppm benzene):						
CHEVRON	EL PASO	TX	6.60E+04	K052	3.3E+01	5.0E-04
CITGO PETROLEUM	LAKE CHARLES	LA	3.20E+05	K052	9.6E+01	3.0E-04
CHEVRON	SALT LAKE CITY	UT	4.50E+04	K052	3.6E+00	8.1E-05 **
AMOCO OIL REFINERY	YORKTOWN	VA	5.10E+04	K052	9.1E-01	1.8E-05
KOCH REFINING	ROSEMOUNT	MN	2.19E+05	K052	9.1E-01	4.2E-06

* BPD = BARRELS PER DAY.

** MEDIAN VALUE USED IN THE ANALYSIS.

Wastewater Volatile Organic Compound Emissions--Background Information for BACT/LAER Determinations."¹¹ Modeling results are presented for toluene, a compound with a volatility very similar to that of benzene, in several different types of wastewater treatment units. A typical layout of a petroleum refinery wastewater treatment system is given in Figure 2-1. The system is composed of a wastewater collection system (process drains, sewer lines, lift stations, junction boxes), an oil-water separator, air flotation unit, equalization basin, clarifier, and biobasin. For the system in Figure 2-1, the oil-water separator is assumed to be an open unit and the equalization basin is not aerated for mixing. A second system was constructed in Figure 2-2 with a covered oil-water separator because some refineries have applied covers to reduce emissions of volatile compounds.

Each figure presents the distribution of benzene for 1 unit of benzene that enters the wastewater collection system. For the collection system, the CTC document provided estimates for 3 model units with fractions emitted of 0.21, 0.38, and 0.44.¹¹ An average value of 0.34 (34 percent of the benzene entering the collection system is emitted) was used for the petroleum refinery wastewater collection system. A fraction emitted of 0.47 from the CTC document was used for the open oil-water separator, and emissions from the covered oil-water separator were assumed to be negligible. The results for an aerated equalization basin were used to simulate the air stripping that occurs in an air flotation unit (fraction emitted=0.99). For the nonaerated equalization basin, the CTC document estimates the fraction emitted as 0.4. For the clarifier and biobasin, the fractions emitted were

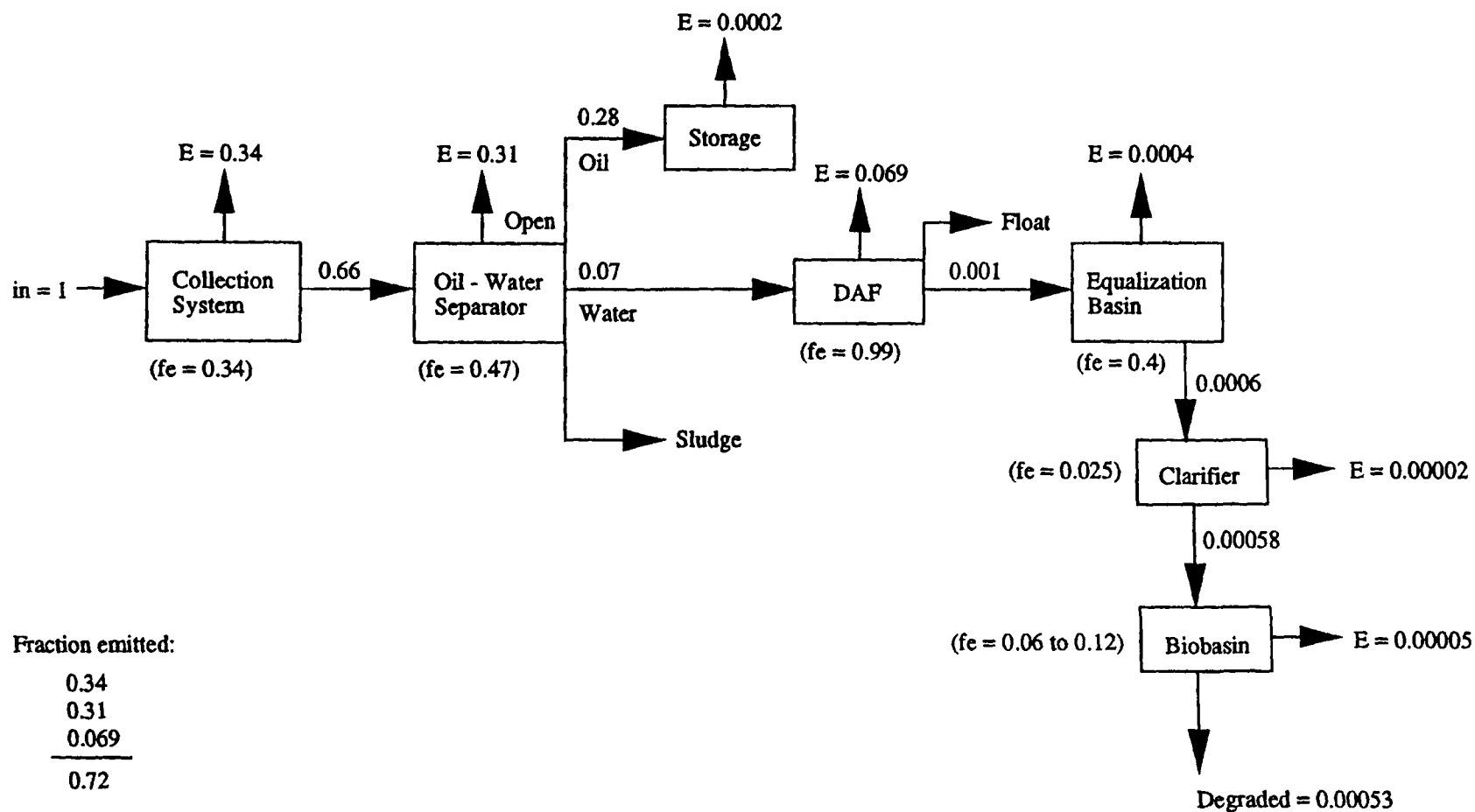


FIGURE 2-1. DISTRIBUTION OF BENZENE IN WASTEWATER TREATMENT (open separator)

(E = fraction of original quantity emitted; fe = fraction entering the unit that is emitted)

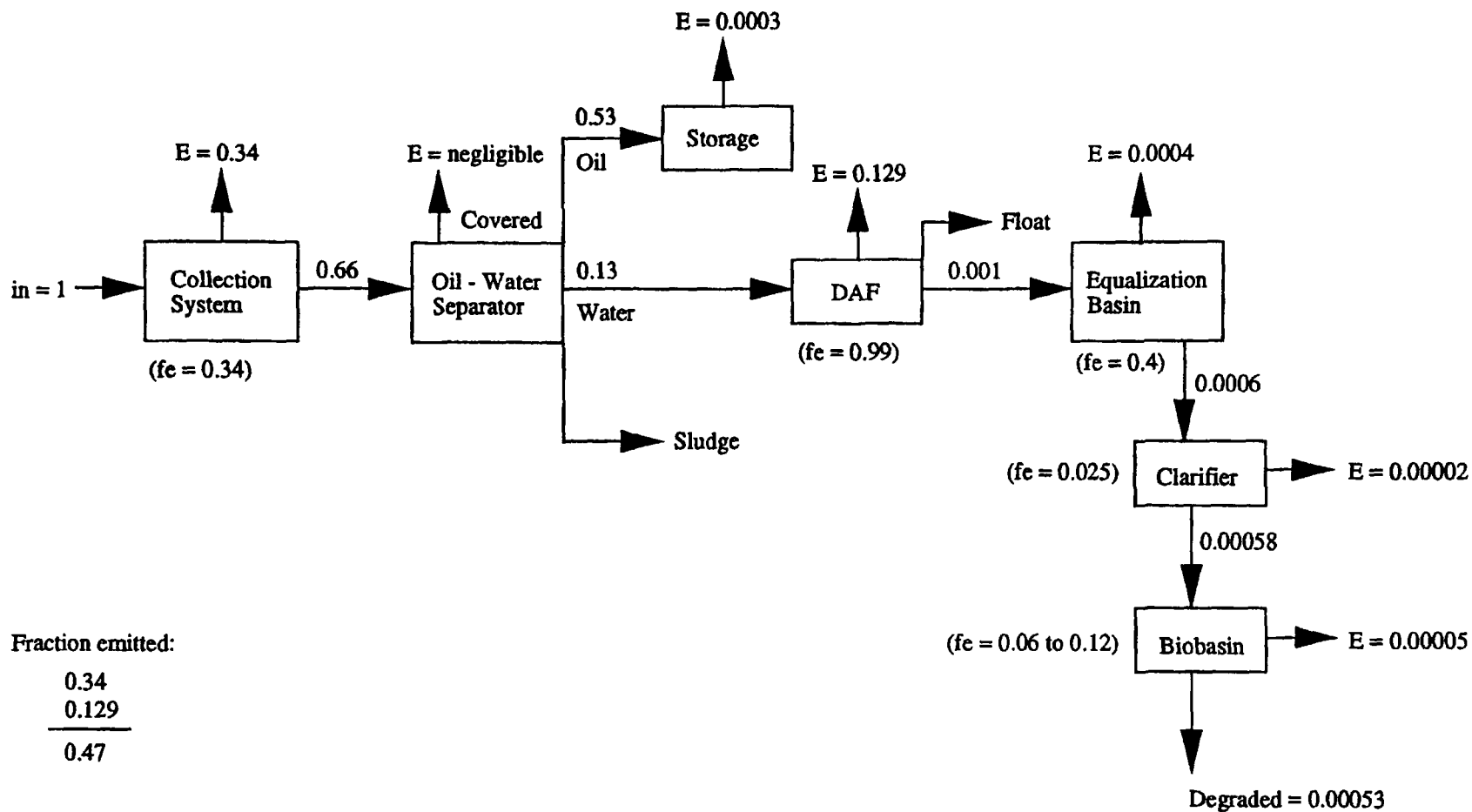


FIGURE 2-2. DISTRIBUTION OF BENZENE IN WASTEWATER TREATMENT (covered separator)

(E = fraction of original quantity emitted; fe = fraction entering the unit that is emitted)

estimated as 0.025 and 0.06 to 0.12, respectively. Approximately 88 to 93 percent of the benzene that reaches the biobasin is estimated to be biodegraded.¹¹

Several commenters pointed out that the benzene leaving the oil-water separator preferentially partitions into the oil layer. One commenter stated that 10 to 20 percent of the benzene leaves with the water⁷, and another estimated that 10 to 30 percent leaves with the water.⁶ For this analysis, a midrange value of 20 percent in the water (and 80 percent of the benzene removed with the oil) was used. This approach predicts that 28 to 53 percent of the benzene that enters the wastewater collection system is recovered with the waste oil from the oil-water separator. The quantity of sludge (K048, K049, and K051) removed from these units is estimated to be small relative to the total wastewater; consequently, fractions emitted with these sludges are not included in the figure. The estimated total fraction emitted for the two model units ranges from 0.47 (with a covered separator) to 0.72 (with an open separator) with a midrange value of 0.6. The midrange value was used to estimate emissions from petroleum refinery wastewater treatment systems.

The most common treatment processes listed for DAF float and slop oil solids (K048 and K049) from the generator's survey were wastewater treatment tanks and land treatment. Land treatment was also the most prevalent process used for the other sludges (K050, K051, and K052). For these sludges, most of the benzene is predicted to be emitted when they are handled in open sources. For land treatment, a fraction emitted of 0.93 was used, and a value of 0.98 was used for wastewater treatment

(e.g., dewatering) followed by land treatment (see Table B-1 in Appendix B, and Appendix C for more details). These fractions emitted were used with the previously discussed ranges of benzene concentration and estimated waste quantities for these sludges to estimate a range of benzene emissions (presented in Table A-3 in Appendix A). However, the estimated benzene emissions from these sludges are low compared to the estimated emissions from the wastewater because of the much larger quantities of wastewater that are generated.

The baseline emission estimates for the petroleum refineries are summarized in Table 2-5. The range of estimates is based on the previously discussed ranges used for benzene concentration. The emissions come primarily from the wastewater from which 60 percent of the benzene was estimated to be emitted. For the controlled emission case, an emission reduction of 99 percent was used based on steam stripping. The control was applied only for those cases in which the total amount of benzene in aqueous waste exceeded 10 Mg/yr and the individual waste stream had a benzene concentration greater than or equal to 10 ppm. When the lower end of the concentration range is used (minimum case), fewer facilities are controlled. In addition, 3 of the 13 process wastewater streams are not controlled at the lower end of the concentration range because they were assigned a benzene concentration of 8 ppm for the minimum case.

The results of this analysis indicated that a range of 52 to 137 petroleum refineries have 10 Mg/yr or more of benzene in their aqueous waste. A range of 923 to 3,330 individual waste streams at these facilities (with 10 Mg/yr or more benzene) are estimated to have a benzene concentration of 10 ppm or more.

TABLE 2-5. BENZENE EMISSION ESTIMATES FOR PETROLEUM REFINERIES

No. PLANT	CITY	ST	AQUEOUS (a) BENZENE (Mg/yr)		TOTAL WASTE (b) CONTROLLED (Mg/yr)		BASELINE EMISSIONS (Mg/yr)		CONTROLLED EMISSIONS (Mg/yr)	
			MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
1 AMERADA HESS	PURVIS	MS	2.1E+00	2.0E+01	0.0E+00	1.3E+05	1.3E+00	1.2E+01	1.2E-01	1.3E+00
2 AMERADA-HESS	PORT READING	NJ	9.9E-01	2.4E+01	0.0E+00	7.6E+04	5.9E-01	1.5E+01	1.5E-01	5.9E-01
3 AMOCO	TEXAS CITY	TX	6.5E+01	5.6E+02	8.8E+05	2.2E+06	3.9E+01	3.4E+02	3.4E+00	5.9E+00
4 AMOCO	MANDAN	ND	4.1E+00	3.7E+01	0.0E+00	2.5E+05	2.4E+00	2.2E+01	2.3E-01	2.4E+00
5 AMOCO	SAVANNAH	GA	8.2E-01	1.1E+01	0.0E+00	1.0E+05	4.9E-01	6.4E+00	6.4E-02	4.9E-01
6 AMOCO	CASPER	WY	2.5E+00	2.3E+01	0.0E+00	1.7E+05	1.5E+00	1.4E+01	1.4E-01	1.5E+00
7 AMOCO	WHITING	IN	3.4E+01	3.2E+02	5.9E+05	1.7E+06	2.0E+01	1.9E+02	1.9E+00	4.8E+00
8 AMOCO	YORKTOWN	VA	4.3E+00	5.3E+01	0.0E+00	2.9E+05	2.6E+00	3.2E+01	3.2E-01	2.6E+00
9 AMOCO	SALT LAKE CITY	UT	2.7E+00	2.5E+01	0.0E+00	1.7E+05	1.6E+00	1.5E+01	1.5E-01	1.6E+00
10 ANCHOR REF.	MCKITTRICK	CA	2.9E-01	3.8E+00	0.0E+00	0.0E+00	1.8E-01	2.3E+00	1.8E-01	2.3E+00
11 ARCO ALASKA	KUPARUK	AK	3.5E-01	4.5E+00	0.0E+00	0.0E+00	2.1E-01	2.7E+00	2.1E-01	2.7E+00
12 ARCO ALASKA	PRUDHOE BAY	AK	4.1E-01	5.3E+00	0.0E+00	0.0E+00	2.5E-01	3.2E+00	2.5E-01	3.2E+00
13 ARCO PETROLEUM	FERNDALE	WA	1.6E+01	1.4E+02	3.2E+05	8.1E+05	9.6E+00	8.5E+01	8.5E-01	2.2E+00
14 ASHLAND	CANTON	OH	5.5E+00	4.1E+01	0.0E+00	2.8E+05	3.3E+00	2.5E+01	2.5E-01	3.3E+00
15 ASHLAND	ST. PAUL PARK	MN	6.0E+00	4.1E+01	0.0E+00	2.8E+05	3.6E+00	2.5E+01	2.5E-01	3.6E+00
16 ASHLAND	ASHLAND	KY	1.9E+01	1.7E+02	3.0E+05	9.5E+05	1.1E+01	1.0E+02	1.0E+00	2.9E+00
17 ATLANTIC REFINING	PHILADELPHIA	PA	1.3E+01	7.3E+01	1.3E+05	5.1E+05	8.0E+00	4.4E+01	4.4E-01	1.7E+00
18 ATLANTIC RICHFIELD	CARSON	CA	1.8E+01	2.1E+02	5.0E+05	1.1E+06	1.1E+01	1.2E+02	1.2E+00	2.9E+00
19 BARRETT REF.	THOMAS	OK	3.8E-01	4.9E+00	0.0E+00	0.0E+00	2.3E-01	3.0E+00	2.3E-01	2.9E+00
20 BELCHER REF.	MOBILE BAY	AL	4.2E-01	4.8E+01	0.0E+00	5.1E+04	2.5E-01	2.9E+01	2.5E-01	2.9E-01
21 BERRY PETROLEUM	STEVENS	AK	1.1E-01	1.4E+00	0.0E+00	0.0E+00	6.7E-02	8.6E-01	6.7E-02	8.6E-01
22 BIG WEST OIL	SALT LAKE CITY	UT	1.6E+00	1.2E+01	0.0E+00	9.5E+04	9.4E-01	7.5E+00	7.5E-02	9.4E-01
23 BLOOMFIELD REFINING	BLOOMFIELD	NM	1.0E+00	9.5E+00	0.0E+00	0.0E+00	6.2E-01	5.7E+00	6.2E-01	5.7E+00
24 BP OIL	MARCUS HOOK	PA	1.3E+01	9.8E+01	1.9E+05	7.0E+05	8.0E+00	5.9E+01	5.9E-01	2.3E+00
25 BP OIL	BELLE CHASSE	LA	3.0E+01	3.0E+02	4.3E+05	1.0E+06	1.8E+01	1.8E+02	1.8E+00	2.7E+00
26 CALCASIEU REFINING	LAKE CHARLES	LA	3.5E-01	4.5E+00	0.0E+00	0.0E+00	2.1E-01	2.7E+00	2.1E-01	2.7E+00
27 CALUMET REFINING COM	PRINCETON	LA	1.2E-01	1.5E+00	0.0E+00	0.0E+00	7.2E-02	9.3E-01	7.2E-02	9.3E-01
28 CANAL REF.	CHURCH POINT	LA	5.8E-01	4.1E+00	0.0E+00	0.0E+00	3.5E-01	2.5E+00	3.5E-01	2.5E+00
29 CENEX REF.	LAUREL	MT	3.3E+00	2.3E+01	0.0E+00	1.7E+05	2.0E+00	1.4E+01	1.4E-01	2.0E+00
30 CHAMPLIN PETROLEUM C	CORPUS CHRISTI	TX	1.8E+01	1.7E+02	3.6E+05	8.2E+05	1.1E+01	1.0E+02	1.0E+00	2.1E+00
31 CHEMOIL	SIGNAL HILL	CA	4.2E-01	5.4E+00	0.0E+00	0.0E+00	2.5E-01	3.3E+00	2.5E-01	3.3E+00
32 CHEVRON	PASCAGOULA	MS	3.0E+01	2.7E+02	5.6E+05	1.5E+06	1.8E+01	1.6E+02	1.6E+00	4.1E+00
33 CHEVRON	PERTH AMBOY	NJ	2.3E+00	3.0E+01	0.0E+00	2.9E+05	1.4E+00	1.8E+01	1.8E-01	1.4E+00
34 CHEVRON	KENAI	AK	6.5E-01	8.3E+00	0.0E+00	0.0E+00	3.9E-01	5.0E+00	3.9E-01	5.0E+00
35 CHEVRON	SALT LAKE CITY	UT	3.0E+00	3.8E+01	0.0E+00	2.3E+05	1.8E+00	2.3E+01	2.3E-01	1.8E+00
36 CHEVRON	PORTLAND	OR	4.4E-01	5.6E+00	0.0E+00	0.0E+00	2.6E-01	3.4E+00	2.6E-01	3.4E+00
37 CHEVRON	PHILADELPHIA	PA	1.4E+01	1.3E+02	2.1E+05	7.3E+05	8.4E+00	7.5E+01	7.6E-01	2.4E+00
38 CHEVRON	PORT ARTHUR	TX	2.9E+01	2.9E+02	5.5E+05	1.5E+06	1.7E+01	1.7E+02	1.7E+00	4.5E+00
39 CHEVRON	EL PASO	TX	6.2E+00	4.0E+01	0.0E+00	2.8E+05	3.7E+00	2.4E+01	2.4E-01	3.7E+00
40 CHEVRON	EL SEGUNDO	CA	2.1E+01	1.7E+02	3.0E+05	1.3E+06	1.2E+01	1.0E+02	1.0E+00	4.5E+00
41 CHEVRON	HONOLULU	HI	1.8E+00	2.9E+01	0.0E+00	2.1E+05	1.1E+00	1.7E+01	1.7E-01	1.1E+00
42 CHEVRON	RICHMOND	CA	2.0E+01	1.5E+02	2.7E+05	1.1E+06	1.2E+01	8.8E+01	8.8E-01	3.7E+00
43 CHEVRON	SEATTLE	WA	1.5E-01	1.9E+00	0.0E+00	0.0E+00	8.8E-02	1.1E+00	8.8E-02	1.1E+00
44 CIBRO PETROLEUM	ALBANY	NY	1.3E+00	1.6E+01	0.0E+00	1.5E+05	7.5E-01	9.7E+00	9.8E-02	7.5E-01
45 CITGO PETROLEUM	LAKE CHARLES	LA	3.0E+01	3.0E+02	7.0E+05	1.7E+06	1.8E+01	1.8E+02	1.8E+00	4.4E+00
46 CLARK OIL & REFINING	BLUE ISLAND	IL	7.0E+00	4.2E+01	0.0E+00	2.8E+05	4.2E+00	2.6E+01	2.6E-01	4.2E+00
47 CLARK OIL & REFINING	HARTFORD	IL	4.9E+00	5.8E+01	0.0E+00	3.2E+05	3.0E+00	3.5E+01	3.5E-01	2.9E+00
48 COASTAL EAGLE PT.	WESTVILLE	NJ	1.8E+01	1.5E+02	1.9E+05	5.3E+05	1.1E+01	9.2E+01	9.3E-01	1.5E+00
49 COASTAL REFINING	CORPUS CHRISTI	TX	1.7E+01	1.6E+02	1.9E+05	4.7E+05	1.0E+01	9.4E+01	9.4E-01	1.3E+00
50 COLORADO REF.	COMMERCE CITY	CO	2.4E+00	1.6E+01	0.0E+00	1.2E+05	1.4E+00	9.7E+00	9.8E-02	1.4E+00
51 CONOCO	SANTA MARIA	CA	2.8E-01	3.6E+00	0.0E+00	0.0E+00	1.7E-01	2.2E+00	1.7E-01	2.1E+00
52 CONOCO	PONCA CITY	OK	1.1E+01	1.1E+02	2.4E+05	6.6E+05	6.8E+00	6.5E+01	6.5E-01	1.9E+00
53 CONOCO	COMMERCE CITY	CO	2.7E+00	2.5E+01	0.0E+00	1.8E+05	1.6E+00	1.5E+01	1.5E-01	1.6E+00
54 CONOCO	WESTLAKE	LA	1.3E+01	1.6E+02	3.8E+05	8.6E+05	7.5E+00	9.4E+01	9.4E-01	2.1E+00
55 CONOCO	BILLINGS	MT	3.6E+00	2.8E+01	0.0E+00	2.0E+05	2.2E+00	1.7E+01	1.7E-01	2.2E+00
56 CROSS OIL & REFINING	SMACKOVER	AR	2.0E-01	2.6E+00	0.0E+00	0.0E+00	1.2E-01	1.5E+00	1.2E-01	1.5E+00
57 CROWN CENTRAL	HOUSTON	TX	1.2E+01	1.1E+02	2.2E+05	5.2E+05	7.3E+00	6.6E+01	6.6E-01	1.4E+00
58 CRYSEN REFINING	WOODS CROSS	UT	8.2E-01	5.3E+00	0.0E+00	0.0E+00	4.9E-01	3.2E+00	4.9E-01	3.2E+00
59 CRYSTAL REF.	CARSON CITY	MI	1.2E-01	1.5E+00	0.0E+00	0.0E+00	7.1E-02	9.1E-01	7.0E-02	9.0E-01
60 DERBY REFINING COMPA	WICHITA	KS	2.6E+00	2.9E+01	0.0E+00	1.6E+05	1.5E+00	1.8E+01	1.8E-01	1.5E+00
61 DERBY REF.	EL DORADO	KS	1.8E+00	1.9E+01	0.0E+00	1.3E+05	1.1E+00	1.1E+01	1.1E-01	1.1E+00
62 DIAMOND SHAMROCK	SUNRAY	TX	8.4E+00	6.7E+01	0.0E+00	4.5E+05	5.0E+00	4.0E+01	4.1E-01	5.0E+00
63 DIAMOND SHAMROCK	THREE RIVERS	TX	3.5E+00	3.0E+01	0.0E+00	2.1E+05	2.1E+00	1.8E+01	1.8E-01	2.1E+00

TABLE 2-5. BENZENE EMISSION ESTIMATES FOR PETROLEUM REFINERIES

No. PLANT	CITY	ST	AQUEOUS (a) BENZENE (Mg/yr)		TOTAL WASTE (b) CONTROLLED (Mg/yr)		BASELINE EMISSIONS (Mg/yr)		CONTROLLED EMISSIONS (Mg/yr)	
			MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
64 EDGINGTON OIL COMPAN	LONG BEACH	CA	1.2E+00	1.6E+01	0.0E+00	1.5E+05	7.3E-01	9.5E+00	9.5E-02	7.3E-01
65 EL PASO REFINING	EL PASO	TX	1.8E+00	1.8E+01	0.0E+00	1.0E+05	1.1E+00	1.1E+01	1.1E-01	1.1E+00
66 ERGON REF.	VICKSBURG	MS	4.9E-01	6.3E+00	0.0E+00	0.0E+00	3.0E-01	3.8E+00	3.0E-01	3.8E+00
67 EXXON	LINDEN	NJ	1.0E+01	1.1E+02	2.6E+05	6.6E+05	6.3E+00	6.8E+01	6.8E-01	1.8E+00
68 EXXON	BILLINGS	MT	3.2E+00	2.8E+01	0.0E+00	1.9E+05	1.9E+00	1.7E+01	1.7E-01	1.9E+00
69 EXXON	BENICIA	CA	9.3E+00	8.5E+01	0.0E+00	5.7E+05	5.6E+00	5.1E+01	5.2E-01	5.6E+00
70 EXXON	BAYTOWN	TX	3.6E+01	2.9E+02	5.5E+05	2.0E+06	2.2E+01	1.7E+02	1.7E+00	6.7E+00
71 EXXON	BATON ROUGE	LA	3.5E+01	3.9E+02	9.0E+05	2.3E+06	2.1E+01	2.3E+02	2.3E+00	6.2E+00
72 FARMLAND INDUSTRIES	PHILLIPSBURG	KS	1.6E+00	1.1E+01	0.0E+00	9.6E+04	9.5E-01	6.6E+00	6.7E-02	9.5E-01
73 FARMLAND INDUSTRIES	COFFEYVILLE	KS	5.2E+00	5.2E+01	0.0E+00	2.9E+05	3.1E+00	3.1E+01	3.1E-01	3.1E+00
74 FINA OIL	BIG SPRING	TX	5.4E+00	3.8E+01	0.0E+00	2.4E+05	3.2E+00	2.3E+01	2.3E-01	3.2E+00
75 FINA OIL	PORT ARTHUR	TX	1.4E+01	1.1E+02	1.5E+05	4.5E+05	8.3E+00	6.7E+01	6.7E-01	1.4E+00
76 FLETCHER OIL & REFIN	WILMINGTON	CA	1.7E+00	1.6E+01	0.0E+00	1.1E+05	1.0E+00	9.7E+00	9.7E-02	1.0E+00
77 FRONTIER OIL	CHEYENNE	WY	2.6E+00	2.9E+01	0.0E+00	1.7E+05	1.6E+00	1.8E+01	1.8E-01	1.6E+00
78 GIANT REFINERY	GALLUP	NM	1.7E+00	1.2E+01	0.0E+00	7.8E+04	1.0E+00	7.1E+00	7.1E-02	1.0E+00
79 GOLDEN WEST REFINING	SANTA FE SPRING	CA	4.4E+00	2.8E+01	0.0E+00	1.8E+05	2.6E+00	1.7E+01	1.7E-01	2.6E+00
80 HAWAII INDEP. REF.	EWA BEACH	HI	4.2E+00	3.5E+01	0.0E+00	3.0E+05	2.5E+00	2.1E+01	2.1E-01	2.5E+00
81 HILL PETROLEUM	TEXAS CITY	TX	7.9E+00	7.3E+01	0.0E+00	5.1E+05	4.7E+00	4.4E+01	4.4E-01	4.7E+00
82 HILL PETROLEUM	HOUSTON	TX	5.8E+00	6.4E+01	0.0E+00	3.3E+05	3.5E+00	3.9E+01	3.9E-01	3.5E+00
83 HILL PETROLEUM	ST. ROSE	LA	9.7E-01	1.2E+01	0.0E+00	1.2E+05	5.8E-01	7.5E+00	7.6E-02	5.8E-01
84 HILL PETROLEUM	KROTZ SPRINGS	LA	4.1E+00	3.7E+01	0.0E+00	2.4E+05	2.4E+00	2.2E+01	2.2E-01	2.4E+00
85 HOWELL HYDROCARBONS	SAN ANTONIO	TX	7.3E-01	6.2E+00	0.0E+00	0.0E+00	4.4E-01	3.7E+00	4.4E-01	3.7E+00
86 HUNT REFINING	TUSCALOOSA	AL	2.8E+00	3.2E+01	0.0E+00	2.0E+05	1.7E+00	1.9E+01	1.9E-01	1.7E+00
87 HUNTWAY REF.	WILMINGTON	CA	1.6E-01	2.1E+00	0.0E+00	0.0E+00	9.7E-02	1.3E+00	9.7E-02	1.2E+00
88 HUNTWAY REF.	BENECIA	CA	2.5E-01	3.2E+00	0.0E+00	0.0E+00	1.5E-01	1.9E+00	1.5E-01	1.9E+00
89 INDIANA FARM BUREAU	MT. VERNON	IN	1.2E+00	8.7E+00	0.0E+00	0.0E+00	7.3E-01	5.2E+00	7.3E-01	5.2E+00
90 INTERMOUNTAIN REF.	FREDONIA	AZ	1.7E-01	2.1E+00	0.0E+00	0.0E+00	1.0E-01	1.3E+00	1.0E-01	1.3E+00
91 KERN OIL & REFINING	BAKERSFIELD	CA	1.0E+00	8.1E+00	0.0E+00	0.0E+00	6.3E-01	4.9E+00	6.3E-01	4.9E+00
92 KERR MCGEE	WYNNWOOD	OK	3.0E+00	2.8E+01	0.0E+00	1.9E+05	1.8E+00	1.7E+01	1.7E-01	1.8E+00
93 KERR MCGEE	COTTON VALLEY	LA	2.3E-01	2.9E+00	0.0E+00	0.0E+00	1.4E-01	1.8E+00	1.4E-01	1.8E+00
94 KOCH REFINING	CORPUS CHRISTI	TX	1.8E+01	1.5E+02	2.3E+05	6.1E+05	1.1E+01	8.8E+01	8.8E-01	1.8E+00
95 KOCH REFINING	ROSEMOUNT	MN	1.6E+01	2.0E+02	4.6E+05	1.1E+06	9.4E+00	1.2E+02	1.2E+00	3.0E+00
96 LA GLORIA OIL AND GA	TYLER	TX	4.7E+00	4.1E+01	0.0E+00	2.6E+05	2.8E+00	2.4E+01	2.5E-01	2.8E+00
97 LAKESIDE REF.	KALAMAZOO	MI	3.2E-01	2.3E+00	0.0E+00	0.0E+00	1.9E-01	1.4E+00	1.9E-01	1.4E+00
98 LAKETON REFINING	LAKETON	IN	2.4E-01	3.1E+00	0.0E+00	0.0E+00	1.5E-01	1.9E+00	1.5E-01	1.9E+00
99 LION OIL	EL DORADO	AR	3.1E+00	2.9E+01	0.0E+00	2.0E+05	1.9E+00	1.7E+01	1.7E-01	1.9E+00
100 LIQUID ENERGY CORP.	BRIDGEPORT	TX	2.9E-01	3.8E+00	0.0E+00	0.0E+00	1.8E-01	2.3E+00	1.8E-01	2.3E+00
101 LITTLE AMERICA REF.	CASPER	WY	1.8E+00	1.6E+01	0.0E+00	1.0E+05	1.1E+00	9.9E+00	9.9E-02	1.1E+00
102 LOUISIANA LAND & EXP	SARALAND	AL	5.5E+00	3.4E+01	0.0E+00	2.9E+05	3.3E+00	2.1E+01	2.1E-01	3.3E+00
103 LUNDAY-THAGARD CO.	SOUTH GATE	CA	2.3E-01	2.9E+00	0.0E+00	0.0E+00	1.4E-01	1.8E+00	1.4E-01	1.7E+00
104 LYONDELL PETROCHEMIC	HOUSTON	TX	3.4E+01	2.7E+02	5.2E+05	1.3E+06	2.0E+01	1.7E+02	1.7E+00	3.7E+00
105 MANTUA OIL	THOROFARE	NJ	1.3E+00	1.7E+01	0.0E+00	1.6E+05	7.9E-01	1.0E+01	1.0E-01	7.9E-01
106 MAPCO PETROLEUM	NORTH POLE	AK	3.9E+00	4.6E+01	0.0E+00	3.3E+05	2.3E+00	2.8E+01	2.8E-01	2.3E+00
107 MAPCO PETROLEUM	MEMPHIS	TN	3.8E+00	3.8E+01	0.0E+00	2.5E+05	2.3E+00	2.3E+01	2.3E-01	2.3E+00
108 MARATHON PETROLEUM	TEXAS CITY	TX	5.4E+00	5.9E+01	0.0E+00	3.2E+05	3.2E+00	3.5E+01	3.6E-01	3.2E+00
109 MARATHON PETROLEUM	GARYVILLE	LA	1.6E+01	1.5E+02	2.9E+05	1.1E+06	9.9E+00	8.8E+01	8.9E-01	3.5E+00
110 MARATHON PETROLEUM	ROBINSON	IL	2.0E+01	1.4E+02	2.9E+05	8.8E+05	1.2E+01	8.4E+01	8.4E-01	2.7E+00
111 MARATHON PETROLEUM	DETROIT	MI	5.4E+00	4.2E+01	0.0E+00	2.9E+05	3.2E+00	2.6E+01	2.6E-01	3.2E+00
112 MIDATLANTIC REF.	ST. MARYS	WV	3.8E-01	2.2E+00	0.0E+00	0.0E+00	2.3E-01	1.3E+00	2.3E-01	1.3E+00
113 MOBIL	CHALMETTE	LA	1.8E+01	1.7E+02	3.3E+05	7.7E+05	1.1E+01	1.0E+02	1.0E+00	2.0E+00
114 MOBIL	TORRANCE	CA	1.3E+01	1.5E+02	3.8E+05	7.6E+05	7.8E+00	9.0E+01	9.1E-01	1.7E+00
115 MOBIL	PAULSBORO	NJ	8.4E+00	8.9E+01	0.0E+00	5.1E+05	5.1E+00	5.4E+01	5.4E-01	5.1E+00
116 MOBIL	BEAUMONT	TX	2.7E+01	2.1E+02	4.7E+05	1.3E+06	1.6E+01	1.3E+02	1.3E+00	3.8E+00
117 MOBIL	JOLIET	IL	1.6E+01	1.8E+02	4.3E+05	9.7E+05	9.8E+00	1.1E+02	1.1E+00	2.5E+00
118 MONTANA REFINING COM	GREAT FALLS	MT	3.8E-01	3.6E+00	0.0E+00	0.0E+00	2.3E-01	2.2E+00	2.3E-01	2.2E+00
119 MURPHY OIL CORPORATI	MERAJUX	LA	6.9E+00	5.6E+01	0.0E+00	3.9E+05	4.1E+00	3.4E+01	3.4E-01	4.1E+00
120 MURPHY OIL CORPORATI	SUPERIOR	WI	2.4E+00	1.9E+01	0.0E+00	1.3E+05	1.4E+00	1.1E+01	1.1E-01	1.4E+00
121 NATIONAL COOPERATIVE	MCPHERSON	KS	6.0E+00	7.0E+01	0.0E+00	3.8E+05	3.6E+00	4.2E+01	4.2E-01	3.6E+00
122 NAVAJO REFINING	ARTESIA	NM	2.6E+00	2.3E+01	0.0E+00	1.6E+05	1.6E+00	1.4E+01	1.4E-01	1.6E+00
123 NEVADA REF.	TONOPAH	NV	1.3E-01	1.7E+00	0.0E+00	0.0E+00	7.9E-02	1.0E+00	7.9E-02	1.0E+00
124 NEWHALL REFINING CO.	NEWHALL	CA	9.3E-01	7.6E+00	0.0E+00	0.0E+00	5.6E-01	4.6E+00	5.6E-01	4.5E+00
125 OXNARD REF.	OXNARD	CA	1.3E-01	1.6E+00	0.0E+00	0.0E+00	7.6E-02	9.8E-01	7.6E-02	9.7E-01
126 PACIFIC REF.	HERCULES	CA	3.8E+00	2.4E+01	0.0E+00	2.0E+05	2.3E+00	1.5E+01	1.5E-01	2.3E+00

TABLE 2-5. BENZENE EMISSION ESTIMATES FOR PETROLEUM REFINERIES

No. PLANT	CITY	ST	AQUEOUS (a) BENZENE (Mg/yr)		TOTAL WASTE (b) CONTROLLED (Mg/yr)		BASELINE EMISSIONS (Mg/yr)		CONTROLLED EMISSIONS (Mg/yr)	
			MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
127 PARAMOUNT PET.	PARAMOUNT	CA	2.9E+00	1.8E+01	0.0E+00	1.6E+05	1.7E+00	1.1E+01	1.1E-01	1.7E+00
128 PENNZOIL	SHREVEPORT	LA	2.9E+00	1.9E+01	0.0E+00	1.7E+05	1.7E+00	1.2E+01	1.2E-01	1.7E+00
129 PENNZOIL	ROOSEVELT	UT	6.6E-01	6.3E+00	0.0E+00	0.0E+00	4.0E-01	3.8E+00	3.9E-01	3.8E+00
130 PENNZOIL	ROUSEVILLE	PA	1.3E+00	7.0E+00	0.0E+00	0.0E+00	8.1E-01	4.2E+00	8.1E-01	4.2E+00
131 PETRO STAR	NORTH POLE	AK	2.1E-01	2.6E+00	0.0E+00	0.0E+00	1.2E-01	1.6E+00	1.2E-01	1.6E+00
132 PHILLIPS	SWEENEY	TX	1.5E+01	1.4E+02	2.6E+05	7.9E+05	9.1E+00	8.7E+01	8.7E-01	2.4E+00
133 PHILLIPS	WOODS CROSS	UT	1.8E+00	1.5E+01	0.0E+00	1.1E+05	1.1E+00	9.0E+00	9.1E-02	1.1E+00
134 PHILLIPS	BORGER	TX	8.3E+00	7.4E+01	0.0E+00	4.8E+05	5.0E+00	4.5E+01	4.5E-01	5.0E+00
135 PLACID REFINING	PORT ALLEN	LA	3.3E+00	2.9E+01	0.0E+00	2.0E+05	2.0E+00	1.7E+01	1.7E-01	2.0E+00
136 POWERINE OIL	SANTA FE SPRINGS	CA	3.5E+00	4.0E+01	0.0E+00	2.3E+05	2.1E+00	2.4E+01	2.4E-01	2.1E+00
137 PRIDE REFINING	ABILENE	TX	1.3E+00	1.6E+01	0.0E+00	1.5E+05	7.5E-01	9.7E+00	9.8E-02	7.5E-01
138 QUAKER STATE OIL REF	SMETHPORT	PA	5.1E-01	2.9E+00	0.0E+00	0.0E+00	3.1E-01	1.7E+00	3.1E-01	1.7E+00
139 QUAKER STATE OIL REF	NEWELL	WV	8.3E-01	4.6E+00	0.0E+00	0.0E+00	5.0E-01	2.8E+00	5.0E-01	2.8E+00
140 ROCK ISLAND REFINING	INDIANAPOLIS	IN	3.2E+00	2.8E+01	0.0E+00	1.9E+05	1.9E+00	1.7E+01	1.7E-01	1.9E+00
141 SAN JOAQUIN REF.	BAKERSFIELD	CA	5.4E-01	8.1E+00	0.0E+00	0.0E+00	3.2E-01	4.9E+00	3.2E-01	4.9E+00
142 SHELL	MORCO	LA	1.6E+01	1.2E+02	2.3E+05	8.8E+05	9.6E+00	7.4E+01	7.4E-01	2.9E+00
143 SHELL	DEER PARK	TX	2.7E+01	2.3E+02	3.0E+05	9.6E+05	1.6E+01	1.4E+02	1.4E+00	3.0E+00
144 SHELL	WOOD RIVER	IL	2.7E+01	1.9E+02	3.4E+05	1.2E+06	1.6E+01	1.1E+02	1.1E+00	3.8E+00
145 SHELL	MARTINEZ	CA	9.7E+00	9.2E+01	0.0E+00	6.2E+05	5.8E+00	5.5E+01	5.5E-01	5.8E+00
146 SHELL	ANACORTES	WA	7.1E+00	5.7E+01	0.0E+00	3.7E+05	4.3E+00	3.4E+01	3.5E-01	4.3E+00
147 SHELL	WILMINGTON	CA	1.2E+01	1.5E+02	3.8E+05	8.2E+05	7.0E+00	9.2E+01	9.2E-01	2.0E+00
148 SHELL	ODESSA	TX	2.9E+00	2.0E+01	0.0E+00	1.2E+05	1.8E+00	1.2E+01	1.2E-01	1.8E+00
149 SINCLAIR OIL	TULSA	OK	3.7E+00	3.0E+01	0.0E+00	2.1E+05	2.2E+00	1.8E+01	1.8E-01	2.2E+00
150 SINCLAIR OIL	SINCLAIR	WY	4.2E+00	3.3E+01	0.0E+00	2.3E+05	2.5E+00	2.0E+01	2.0E-01	2.5E+00
151 SOHIO	FERNDALE	WA	4.6E+00	4.4E+01	0.0E+00	3.2E+05	2.7E+00	2.6E+01	2.6E-01	2.7E+00
152 SOMERSET REFINERY	SOMERSET	KY	3.1E-01	2.3E+00	0.0E+00	0.0E+00	1.9E-01	1.4E+00	1.9E-01	1.4E+00
153 SOUND REF.	TACOMA	WA	3.5E-01	4.5E+00	0.0E+00	0.0E+00	2.1E-01	2.7E+00	2.1E-01	2.7E+00
154 SOUTHLAND OIL	SANDERSVILLE	MS	3.2E-01	4.1E+00	0.0E+00	0.0E+00	1.9E-01	2.5E+00	1.9E-01	2.5E+00
155 SOUTHLAND OIL	LUMBERTON	MS	1.7E-01	2.2E+00	0.0E+00	0.0E+00	1.0E-01	1.3E+00	1.0E-01	1.3E+00
156 SOUTHWESTERN REFININ	CORPUS CHRISTI	TX	1.2E+01	1.0E+02	1.6E+05	4.8E+05	7.1E+00	6.1E+01	6.1E-01	1.4E+00
157 STANDARD OIL OF OHIO	LIMA	OH	3.0E+01	2.7E+02	3.2E+05	8.4E+05	1.8E+01	1.6E+02	1.6E+00	2.4E+00
158 STANDARD OIL OF OHIO	TOLEDO	OH	1.2E+01	9.9E+01	2.2E+05	5.9E+05	7.1E+00	6.0E+01	6.0E-01	1.7E+00
159 STAR REF.	DELAWARE CITY	DE	1.6E+01	1.1E+02	2.0E+05	6.3E+05	9.4E+00	6.7E+01	6.8E-01	1.9E+00
160 STAR REF.	PORT ARTHUR	TX	1.6E+01	1.6E+02	3.2E+05	1.1E+06	9.4E+00	9.4E+01	9.4E-01	3.4E+00
161 STAR REF.	CONVENT	LA	1.4E+01	1.4E+02	2.7E+05	9.5E+05	8.6E+00	8.2E+01	8.2E-01	3.0E+00
162 SUN CO.	TOLEDO	OH	1.7E+01	1.4E+02	2.1E+05	5.9E+05	1.0E+01	8.5E+01	8.6E-01	1.8E+00
163 SUN CO.	MARCUS HOOK	PA	1.6E+01	1.5E+02	2.6E+05	7.6E+05	9.7E+00	8.8E+01	8.9E-01	2.3E+00
164 SUN CO.	TULSA	OK	8.4E+00	6.8E+01	0.0E+00	3.7E+05	5.1E+00	4.1E+01	4.1E-01	5.1E+00
165 SUNLAND REF.	BAKERSFIELD	CA	6.7E-01	6.0E+00	0.0E+00	0.0E+00	4.0E-01	3.6E+00	4.0E-01	3.6E+00
166 TESARO ALASKA PETROL	KENAI	AK	3.9E+00	2.9E+01	0.0E+00	2.6E+05	2.4E+00	1.8E+01	1.8E-01	2.4E+00
167 TEXACO	EL DORADO	KS	9.0E+00	8.3E+01	0.0E+00	4.0E+05	5.4E+00	5.0E+01	5.0E-01	5.4E+00
168 TEXACO	BAKERSFIELD	CA	5.5E+00	3.8E+01	0.0E+00	2.3E+05	3.3E+00	2.3E+01	2.3E-01	3.3E+00
169 TEXACO	WILMINGTON	CA	1.1E+01	1.2E+02	3.0E+05	5.3E+05	6.7E+00	6.9E+01	6.9E-01	1.1E+00
170 TEXACO	ANACORTES	WA	7.9E+00	8.6E+01	0.0E+00	4.9E+05	4.7E+00	5.1E+01	5.2E-01	4.7E+00
171 TOSCO CORP.	MARTINEZ	CA	1.1E+01	8.2E+01	1.7E+05	5.5E+05	6.8E+00	5.0E+01	5.0E-01	1.7E+00
172 TOTAL PETROLEUM	ARKANSAS CITY	KS	4.4E+00	3.3E+01	0.0E+00	2.3E+05	2.6E+00	2.0E+01	2.0E-01	2.6E+00
173 TOTAL PETROLEUM	ARDMORE	OK	4.0E+00	3.6E+01	0.0E+00	2.5E+05	2.4E+00	2.2E+01	2.2E-01	2.4E+00
174 TOTAL PETROLEUM	ALMA	MI	3.7E+00	2.8E+01	0.0E+00	1.8E+05	2.2E+00	1.7E+01	1.7E-01	2.2E+00
175 TRIFINERY	CORPUS CHRISTI	TX	8.4E-01	1.1E+01	0.0E+00	1.0E+05	5.0E-01	6.5E+00	6.5E-02	5.0E-01
176 UNION OIL OF CALIFOR	WILMINGTON	CA	6.3E+00	8.0E+01	0.0E+00	4.1E+05	3.8E+00	4.8E+01	4.8E-01	3.8E+00
177 UNION OIL OF CALIFOR	LEMONT	IL	1.3E+01	1.5E+02	3.1E+05	7.6E+05	8.0E+00	8.8E+01	8.8E-01	2.0E+00
178 UNION OIL OF CALIFOR	RODEO	CA	1.1E+01	1.2E+02	2.9E+05	6.3E+05	6.8E+00	7.1E+01	7.2E-01	1.6E+00
179 UNION OIL OF CALIFOR	NEDERLAND	TX	1.2E+01	1.0E+02	1.5E+05	5.2E+05	7.3E+00	6.1E+01	6.1E-01	1.7E+00
180 UNITED REF.	WARREN	PA	4.7E+00	3.7E+01	0.0E+00	2.7E+05	2.8E+00	2.2E+01	2.2E-01	2.8E+00
181 UNOCAL	LOS ANGELES	CA	1.2E+01	7.6E+01	1.5E+05	4.8E+05	7.2E+00	4.6E+01	4.6E-01	1.5E+00
182 U.S. OIL & REFINING	TACOMA	WA	1.9E+00	1.4E+01	0.0E+00	1.2E+05	1.1E+00	8.2E+00	8.2E-02	1.1E+00
183 VALERO ENERGY CORP.	CORPUS CHRISTI	TX	1.7E+00	3.4E+01	0.0E+00	1.5E+05	9.9E-01	2.0E+01	2.0E-01	9.9E-01
184 WITCO CORP.	BRADFORD	PA	7.5E-01	3.8E+00	0.0E+00	0.0E+00	4.5E-01	2.3E+00	4.5E-01	2.3E+00
185 WITCO CORP.	OILDALE	CA	3.2E-01	4.1E+00	0.0E+00	0.0E+00	1.9E-01	2.5E+00	1.9E-01	2.4E+00
186 WYOMING REF.	NEWCASTLE	WY	8.7E-01	7.2E+00	0.0E+00	0.0E+00	5.2E-01	4.3E+00	5.2E-01	4.3E+00
187 YOUNG REF.	DOUGLASVILLE	GA	2.6E-01	3.3E+00	0.0E+00	0.0E+00	1.6E-01	2.0E+00	1.6E-01	2.0E+00

(a) Aqueous benzene - quantity of benzene in aqueous wastes (over 10 percent water).

(b) Total waste controlled - total quantity of all wastes (process wastewater, sludges, etc.) with a benzene concentration of 10 ppm or more at facilities with 10 Mg/yr or more benzene in aqueous wastes.

3. COKE BY-PRODUCT RECOVERY PLANTS

A review of data presented in the effluent guidelines document¹² for this industry (prepared by the Office of Water) and in the background document for the benzene NESHAP for coke plants¹³ indicated that there are three major benzene-containing wastes. These wastes include ammonia liquor with benzene concentrations of 3.4 to 182 ppm, wastewater from the light oil decanter, and wastewater from the wash oil decanter with combined benzene concentrations of 18 to 97 ppm. The latter two streams are identified collectively as light oil plant wastewater. The effluent guidelines document estimates that ammonia liquor is generated at a rate of about 47 gal/ton of coke and that light oil plant wastewater is generated at about 54 gal/ton of coke. Ammonia liquor is routinely stripped in the ammonia stripper, and volatiles are recycled back to the coke oven gas. However, the ammonia liquor may be stored in open or covered tanks prior to stripping. Some plants also strip the wastewater from the light oil plant, and others send it to the wastewater treatment system.

The quantity of wastewater and the quantity of benzene in the wastewater were estimated from the generation factors (gal/ton of coke), ranges of benzene concentration, and updated information on coke capacity. Air emission controls are already required for ammonia liquor tanks at metallurgical coke plants by the benzene NESHAP (40 CFR 61.130, Subpart L). For the baseline emission estimates, a fraction emitted of 0.03 to 0.18 (see Appendix C) was used for ammonia liquor tanks, and 95-percent control was applied at metallurgical plants. To reflect that some plants currently strip light oil plant wastewater, an assumption

was made that 50 percent of this wastewater is stripped and 50 percent goes to wastewater treatment. The fraction emitted for that portion going to wastewater treatment was estimated to range from 0.4 (nonaerated equalization basin) to 0.99 (aerated equalization basin).¹¹ A control efficiency of 99 percent was used for wastewater that is stripped (fraction emitted = 0.01).

The midrange value of fraction emitted was applied to all coke plants in EPA's data base, in combination with a range of benzene concentrations and an estimate of waste quantity, to produce a range of emission estimates. The results for coke by-product plants are summarized in Table 3-1. From this analysis, a range of 1 to 29 coke plants is estimated to have 10 Mg/yr or more of benzene in their aqueous wastes. A range of 2 to 58 waste streams at these plants is estimated to have benzene concentrations exceeding 10 ppm and may not be controlled currently.

4. OFF-SITE TREATMENT, STORAGE, AND DISPOSAL FACILITIES (TSDF)

Wastes containing benzene that are shipped offsite for treatment and disposal were identified from national surveys of hazardous waste TSDF and generators. A total of 48 facilities receiving these wastes from offsite is listed in Table 4-1. Additional details on the waste streams at these facilities are provided in Appendix B (Table B-3), which provides a listing of the data extracted from the surveys.

The approach used to estimate emissions is essentially the same as that used at proposal with one major exception. The fraction emitted for the entire wastewater treatment system was previously estimated as

TABLE 3-1. BENZENE EMISSION ESTIMATES FOR COKE PLANTS

No. PLANT	CITY	ST	COKE CAPACITY (Mg/yr)	AQUEOUS (a) BENZENE (Mg/yr)		BASELINE EMISSIONS (Mg/yr)		CONTROLLED EMISSIONS (Mg/yr)	
				MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
1 ABC COKE	TARRANT	AL	5.8E+05	2.7E+00	3.3E+01	4.7E-01	9.9E+00	1.7E-01	4.7E-01
2 ACME STEEL	CHICAGO	IL	5.8E+05	2.7E+00	3.3E+01	4.6E-01	6.3E+00	2.5E-01	4.6E-01
3 ARMCO INC	MIDDLETOWN	OH	1.4E+06	6.6E+00	8.2E+01	1.1E+00	1.6E+01	6.2E-01	1.1E+00
4 ARMCO INC.	ASHLAND	KY	1.1E+06	4.9E+00	6.1E+01	8.4E-01	1.2E+01	4.6E-01	8.4E-01
5 BETHLEHEM STEEL	BURNS HARBOR	IN	1.8E+06	8.2E+00	1.0E+02	1.4E+00	1.9E+01	7.6E-01	1.4E+00
6 BETHLEHEM STEEL	LACKAWANNA	NY	1.2E+06	5.4E+00	6.6E+01	9.2E-01	1.3E+01	5.0E-01	9.2E-01
7 BETHLEHEM STEEL	BETHLEHEM	PA	1.5E+06	7.1E+00	8.8E+01	1.2E+00	1.7E+01	6.6E-01	1.2E+00
8 BETHLEHEM STEEL	SPARROWS POINT	MD	1.2E+06	5.7E+00	7.1E+01	9.8E-01	1.3E+01	5.3E-01	9.8E-01
9 CITIZENS GAS	INDIANAPOLIS	IN	4.8E+05	2.2E+00	2.7E+01	3.9E-01	8.1E+00	1.3E-01	3.9E-01
10 DETROIT COKE	DETROIT	MI	6.2E+05	2.9E+00	3.5E+01	5.0E-01	1.1E+01	1.9E-01	5.0E-01
11 EMPIRE COKE COMPANY	TUSCALOOSA	AL	1.6E+05	7.5E-01	9.2E+00	1.3E-01	2.7E+00	1.3E-01	2.7E+00
12 ERIE COKE	ERIE	PA	2.1E+05	9.6E-01	1.2E+01	1.7E-01	3.5E+00	6.5E-02	1.7E-01
13 GENEVA STEEL	PROVO	UT	1.2E+06	5.4E+00	6.7E+01	9.2E-01	1.3E+01	5.0E-01	9.2E-01
14 GULF STATES	GADSDEN	AL	7.6E+05	3.5E+00	4.3E+01	6.2E-01	1.3E+01	4.2E-01	6.2E-01
15 INLAND STEEL	E CHICAGO	IN	1.8E+06	8.5E+00	1.1E+02	1.5E+00	2.0E+01	7.9E-01	1.5E+00
16 KOPPERS	WOODWARD	AL	6.9E+05	3.2E+00	4.0E+01	5.6E-01	1.2E+01	2.0E-01	5.6E-01
17 LTV STEEL	CLEVELAND	OH	1.6E+06	7.2E+00	8.9E+01	1.2E+00	1.7E+01	6.7E-01	1.2E+00
18 LTV STEEL	S CHICAGO	IL	6.0E+05	2.8E+00	3.4E+01	4.7E-01	6.5E+00	2.6E-01	4.7E-01
19 LTV STEEL	WARREN	OH	5.4E+05	2.5E+00	3.1E+01	4.3E-01	5.9E+00	2.3E-01	4.3E-01
20 LTV STEEL COMPANY	PITTSBURGH	PA	1.8E+06	8.3E+00	1.0E+02	1.4E+00	2.0E+01	7.7E-01	1.4E+00
21 NATIONAL STEEL	GRANITE CITY	IL	6.3E+05	2.9E+00	3.6E+01	5.0E-01	6.8E+00	2.7E-01	5.0E-01
22 NATIONAL STEEL GROUP	ECORSE	MI	3.5E+05	1.6E+00	2.0E+01	2.7E-01	3.8E+00	1.5E-01	2.7E-01
23 NEW BOSTON COKE	PORTSMOUTH	OH	3.6E+05	1.7E+00	2.1E+01	3.0E-01	6.2E+00	1.3E-01	3.0E-01
24 SHARON STEEL	MONESSEN	PA	2.9E+05	1.4E+00	1.7E+01	2.3E-01	3.2E+00	1.3E-01	2.3E-01
25 SHENANGO	SHENANGO	PA	5.2E+05	2.4E+00	3.0E+01	4.1E-01	5.7E+00	2.2E-01	4.1E-01
26 SLOSS INDUSTRIES	BIRMINGHAM	AL	4.0E+05	1.8E+00	2.3E+01	3.2E-01	6.8E+00	1.2E-01	3.2E-01
27 TOLEDO COKE	TOLEDO	OH	1.6E+05	7.3E-01	9.0E+00	1.3E-01	2.7E+00	1.3E-01	2.7E+00
28 TONAWANDA	TONAWANDA	NY	3.0E+05	1.4E+00	1.7E+01	2.4E-01	5.1E+00	6.8E-02	2.4E-01
29 U.S. STEEL CORP.	CLAIRTON	PA	3.8E+06	1.8E+01	2.2E+02	3.1E+00	4.2E+01	3.4E-02	1.7E+00
30 U.S. STEEL CORP.	GARY	IN	5.3E+05	2.5E+00	3.0E+01	4.2E-01	5.8E+00	2.3E-01	4.2E-01
31 WHEELING PITT	E STEUBENVILLE	WV	1.5E+06	7.0E+00	8.7E+01	1.2E+00	1.6E+01	6.5E-01	1.2E+00

(a) Aqueous benzene - quantity of benzene in aqueous wastes (over 10 percent water).

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TABLE 4-1. BENZENE EMISSION ESTIMATES FOR OFF-SITE TSDF

No. PLANT	CITY	ST	AQUEOUS (a) BENZENE (Mg/yr)	BASELINE EMISSIONS (Mg/yr)	CONTROLLED EMISSIONS (Mg/yr)
1 ASHLAND CHEMICAL	BOYD CO.	KY	2.3E+02	1.6E+02	1.6E+00
2 CALLEIA RES. RECOVER	BROOKLYN	NY	0.0E+00	1.0E-04	1.0E-04
3 CASMALIA RESOURCES	CASMALIA	CA	5.6E-01	4.3E-01	4.3E-01
4 CECOS INT'L	STAMFORD	CT	1.5E+01	1.1E+01	1.1E-01
5 CECOS INT'L	NIAGRA FALLS	NY	0.0E+00	<1.0E-4	<1.0E-4
6 CECOS INT'L	BRISTOL	CT	0.0E+00	9.4E-03	9.4E-03
7 CECOS INT'L	WILLIAMSBURG	OH	2.1E+00	3.0E+00	3.0E+00
8 CECOS INT'L	CINCINNATI	OH	5.1E-01	3.9E-01	3.9E-01
9 CECOS INT'L	LIVINGSTON	LA	0.0E+00	<1.0E-4	<1.0E-4
10 CHEMICAL PROCESSORS	SEATTLE	WA	0.0E+00	1.2E-03	1.2E-03
11 CHEMICAL RESOURCES	TULSA	OK	5.1E-01	3.0E-04	3.0E-04
12 CHEM-CLEAR INC.	BALTIMORE	MD	2.6E-02	1.8E-02	1.8E-02
13 CHEM-CLEAR INC.	CLEVELAND	OH	3.0E-02	2.3E-02	2.3E-02
14 CHEM-MET SERVICES	WYANDOTTE	MI	2.7E-02	1.9E-02	1.9E-02
15 CHEM. WASTE MGMT	EMELLE	AL	0.0E+00	<1.0E-4	<1.0E-4
16 CHEM. WASTE MGMT.	CALUMET CITY	IL	6.9E-01	5.0E-01	5.0E-01
17 CID-LANDFILL	CALUMET CITY	IL	1.6E-02	1.2E-02	1.2E-02
18 COMMERCIAL DISPOSAL	WEST SPRINGFIELD	MA	0.0E+00	1.0E-04	1.0E-04
19 DELAWARE CONTAINERS	COATSVILLE	PA	0.0E+00	6.5E-01	6.5E-01
20 ECOLOTEC	DAYTON	OH	7.5E+00	8.3E-01	8.3E-01
21 ENSCO	EL DORADO	AR	1.1E-01	1.0E-01	1.0E-01
22 ENVIROSAFE SERVICES	OREGON	OH	1.3E+01	9.5E+00	1.2E-01
23 ENV. ENTERPRISES	CINCINNATI	OH	0.0E+00	1.6E-01	1.6E-01
24 ENV. WASTE RESOURCES	WATERBURY	CT	0.0E+00	<1.0E-4	<1.0E-4
25 ERIEWAY POLL. CONTRO	BEDFORD	OH	1.3E+00	8.9E-01	8.9E-01
26 FRONTIER CHEMICAL	NIAGRA FALLS	NY	4.8E-02	5.3E-03	5.3E-03
27 GULF COAST WASTE DIS	TEXAS CITY	TX	0.0E+00	<1.0E-4	<1.0E-4
28 HANSBROUGH ENERGY	CROWLEY	LA	2.9E+01	2.1E+01	2.9E-01
29 HERITAGE ENV. SERVIC	INDIANAPOLIS	IN	3.1E-02	2.4E-02	2.4E-02
30 INDUSTRIAL WASTE REM	LEWISBERRY	PA	1.0E-03	<1.0E-4	<1.0E-4
31 IT CORPORATION	BENECIA	CA	3.1E-02	3.1E-02	3.1E-02
32 IT CORPORATION	WESTMORELAND	CA	1.5E-01	1.4E-01	1.4E-01
33 IT CORP.-PETROL. WAS	BUTTONWILLOW	CA	8.3E-01	7.8E-01	7.8E-01
34 MALONE SERVICE CO.	TEXAS CITY	TX	0.0E+00	<1.0E-4	<1.0E-4
35 MICHIGAN DISPOSAL IN	BELLEVILLE	MI	5.9E+01	4.0E+01	8.0E-01
36 PEORIA DISPOSAL CO.	PEORIA	IL	2.3E-02	1.7E-02	1.7E-02
37 PETROCHEM RECYCLING	SALT LAKE CITY	UT	4.8E-01	3.7E-01	3.7E-01
38 RMT PROPERTIES	NORTH SALT LAKE	UT	2.7E-02	<1.0E-4	<1.0E-4
39 ROGERS LANDFILL	CENTREVILLE	MS	9.3E-02	8.6E-02	8.6E-02
40 ROLLINS ENV. SERVICE	BRIDGEPORT	NJ	1.2E+00	1.0E-04	1.0E-04
41 ROLLINS ENV. SERVICE	DEER PARK	TX	2.9E+02	4.4E+01	1.2E+00
42 SOLVENT RECOV. SERVI	LINDEN	NJ	4.0E-03	4.0E-04	4.0E-04
43 TEXAS ECOLOGISTS	ROBSTOWN	TX	3.8E+00	2.8E+00	2.8E+00
44 TRICIL ENV. SERVICES	MUSKEGON HEIGHT	MI	0.0E+00	<1.0E-4	<1.0E-4
45 USPCI GRASSY MT.	KNOWLES	UT	3.6E+00	3.1E+00	3.1E+00
46 WASTE CONVERSION	HATFIELD	PA	6.3E+01	4.3E+01	1.2E+00
47 WASTE TECH SERVICES	GOLDEN	CO	2.0E-03	<1.0E-4	<1.0E-4
48 WAYNE DISPOSAL	BELLEVILLE	MI	1.0E-03	1.0E-04	1.0E-04

(a) Aqueous benzene - quantity of benzene in aqueous wastes (over 10 percent water).

0.97. However, revisions were made to the modeling approach for the wastewater collection system described in the CTC document,¹¹ and the revised estimate is a fraction emitted of 0.73 for the wastewater treatment system. This estimate is an average for the 3 model units that are described in Reference 11. The revised fractions emitted for each process sequence are given in Table B-1 and the control efficiencies applied to the processing sequence are given in Table B-2 (Appendix B).

In conjunction with changes to the proposed regulation, the revised analysis included only benzene in aqueous wastes (10 percent or more water) in determining exceedances of the 10 Mg/yr cutoff. Emission controls were applied to facilities that exceeded the cutoff. Table 4-1 lists the estimated quantity of benzene in aqueous wastes, the baseline emission estimates, and controlled emission estimates for the off-site TSDF. Controls were applied when the quantity of benzene in aqueous wastes was 10 Mg/yr or more and an individual waste stream had a benzene concentration of 10 ppm or more. A total of 7 of these TSDF are estimated to manage wastes with 10 Mg/yr or more of benzene and have 30 waste streams with a benzene concentration of 10 ppm or more.

5. CHEMICAL PLANTS

The data used to identify wastes with benzene at chemical plants were the same as those used at proposal. However, several revisions were made in the approach used to estimate emissions. The fraction emitted for wastewater treatment systems was revised from 0.97 to 0.73 as described in the previous section. This change also affected the

fractions emitted for those processing sequences that included wastewater treatment. The revised fractions emitted are given in Table B-1, Appendix B.

The second change was made to account for benzene volatilized from the wastewater prior to sampling. The benzene concentration and waste quantity data for many of the chemical plants were reported for the equalization basin, after the wastewater had traveled through the collection system and had been mixed with other wastewater streams. The results for the model units presented in the CTC document¹¹ showed that up to 44 percent of the benzene may be emitted in the wastewater collection system prior to entering the equalization basin. An upper bound emission estimate was developed to include these potential emissions from the collection system (based on 44-percent emitted), which may have occurred prior to the sampling point for the reported concentration.

Another revision in this analysis was the use of only the quantity of benzene in aqueous wastes for comparison with the 10 Mg/yr cutoff, which excludes the quantity of benzene in organic liquids. In addition, comments were received from specific plants that have already implemented treatment to strip and recover benzene from their wastewater. The baseline emission estimates for these plants (Plants No. 40 and 44 in Table 5.1) were corrected to reflect the current level of treatment.

The previous discussed changes were applied to EPA's data base with a total of 132 chemical plants. The results of the revised analysis for chemical plants are summarized in Table 5.1. A range of 22 to 24 plants are estimated to have 10 Mg/yr or more of benzene in aqueous wastes, and

TABLE 5-1. BENZENE EMISSION ESTIMATES FOR CHEMICAL PLANTS

No. PLANT	CITY	ST	AQUEOUS (a) BENZENE (Mg/yr)		BASELINE EMISSIONS (Mg/yr)		CONTROLLED EMISSIONS (Mg/yr)	
			MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
1 3-M COMPANY	COTTAGE GROVE	MN	5.8E+00	1.0E+01	4.0E-02	7.2E-02	4.0E-02	7.2E-02
2 ABBOTT LABORATORIES	WICHITA	KS	0.0E+00	0.0E+00	9.7E-03	1.7E-02	9.7E-03	1.7E-02
3 AIR PRODUCTS & CHEM.	WICHITA	KS	0.0E+00	0.0E+00	2.4E-02	4.3E-02	2.4E-02	4.3E-02
4 ALDRICH CHEMICALS	MILWAUKEE	WI	0.0E+00	0.0E+00	1.9E-02	3.4E-02	1.9E-02	3.4E-02
5 ALLIED CHEMICAL	IRONTON	OH	4.3E-01	7.7E-01	6.0E-04	1.1E-03	6.0E-04	1.1E-03
6 ALLIED SIGNAL	BIRMINGHAM	AL	4.0E-03	7.2E-03	3.0E-03	5.4E-03	3.0E-03	5.4E-03
7 ALPHA CHEMICAL	LAKELAND	FL	0.0E+00	0.0E+00	9.3E-02	1.7E-01	9.3E-02	1.7E-01
8 ALPHA RESINS	PERRIS	CA	0.0E+00	0.0E+00	1.2E-01	2.2E-01	1.2E-01	2.2E-01
9 AMCHEM PRODUCTS INC.	AMBLER	PA	0.0E+00	0.0E+00	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
10 AMERICAN CYANAMID	BRIDGEWATER	NJ	2.0E-03	3.6E-03	1.0E-04	1.8E-04	1.0E-04	1.8E-04
11 AMERICAN CYANAMID CO	LINDEN	NJ	4.0E-03	7.2E-03	3.0E-03	5.4E-03	3.0E-03	5.4E-03
12 AMERICAN CYANAMID CO	HANNIBAL	MO	0.0E+00	0.0E+00	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
13 AMERICAN HOECHST COR	PASADENA	TX	0.0E+00	0.0E+00	2.9E+01	5.1E+01	2.9E+01	5.1E+01
14 AMERICAN HOECHST COR	HOUSTON	TX	0.0E+00	0.0E+00	3.0E+01	5.4E+01	3.0E+01	5.4E+01
15 AMOCO CHEMICAL	TEXAS CITY	TX	0.0E+00	0.0E+00	8.2E-03	1.5E-02	8.2E-03	1.5E-02
16 ARIS TECH CHEMICAL	HAVERHILL	OH	1.6E+00	2.9E+00	1.2E+00	2.2E+00	1.2E+00	2.2E+00
17 ATLANTIC RICHFIELD	HOUSTON	TX	4.0E-01	7.2E-01	3.7E-01	6.7E-01	3.7E-01	6.7E-01
18 ATLANTIC RICHFIELD C	MONACA	PA	4.6E-01	8.3E-01	3.4E-01	6.1E-01	3.4E-01	6.1E-01
19 ATLANTIC WOOD INDUST	HAINESPORT	NJ	9.5E-01	1.7E+00	6.7E-01	1.2E+00	6.7E-01	1.2E+00
20 ATLANTIC WOOD INDUST	SAVANNAH	GA	4.2E-01	7.5E-01	9.1E-02	1.6E-01	9.1E-02	1.6E-01
21 ATLANTIC WOOD INDUST	PORTSMOUTH	VA	3.8E-01	6.8E-01	2.4E-01	4.3E-01	2.4E-01	4.3E-01
22 AYERST LABS	ROUSES POINT	NY	0.0E+00	0.0E+00	1.3E-02	2.3E-02	1.3E-02	2.3E-02
23 BASF WYANDOTTE CORP.	JAMESBURG	NJ	2.1E+01	3.8E+01	1.5E+01	2.8E+01	1.5E+01	2.8E+01
24 BF GOODRICH	AVON LAKE	OH	7.4E-01	1.3E+00	3.4E-03	6.1E-03	3.4E-03	6.1E-03
25 BF GOODRICH CHEMICAL	CALVERT CITY	KY	0.0E+00	0.0E+00	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
26 BROWNING MANUF.	MORGAN	UT	0.0E+00	0.0E+00	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
27 CAIN CHEMICAL	BRAZORIA	TX	1.7E+01	3.1E+01	1.9E+00	3.4E+00	9.5E-02	1.7E-01
28 CALGON CARBON	NEVILLE ISLAND	PA	1.4E+00	2.6E+00	1.6E-01	2.9E-01	1.6E-01	2.9E-01
29 CELANESE CHEMICAL	BISHOP	TX	3.0E-03	5.4E-03	2.8E-03	5.0E-03	2.8E-03	5.0E-03
30 CELANESE CORP.	PAMPA	TX	9.2E+01	1.7E+02	9.1E+01	1.6E+02	9.1E+01	1.6E+00
31 CHATTEM CHEMICALS	CHATTANOOGA	TN	0.0E+00	0.0E+00	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
32 CIBA CORNING	MEDFIELD	MA	0.0E+00	0.0E+00	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
33 CIBA-GEIGY	TOMS RIVER	NJ	1.0E-03	1.8E-03	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
34 CLARK OIL-CHEMICALS	BLUE ISLAND	IL	6.2E-02	1.1E-01	1.0E-03	1.8E-03	1.0E-03	1.8E-03
35 COSAN CHEMICAL	CARLSTADT	NJ	0.0E+00	0.0E+00	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
36 COSDEN OIL & CHEMICA	BIG SPRING	TX	2.0E-03	3.6E-03	1.1E-01	1.9E-01	1.1E-01	1.9E-01
37 DENKA CHEMICAL CO.	HOUSTON	TX	0.0E+00	0.0E+00	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
38 DEVOE & RAYNOLDS	LOUISVILLE	KY	0.0E+00	0.0E+00	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
39 DIAMOND SHAMROCK COR	DEER PARK	TX	0.0E+00	0.0E+00	1.6E-02	3.0E-02	1.6E-02	3.0E-02
40 DOW CHEMICAL	PLAQUEMINE	LA	1.5E+01	2.7E+01	7.0E-01	7.0E-01	7.0E-01	7.0E-01
41 DOW CHEMICAL	DALTON	GA	0.0E+00	0.0E+00	2.0E-04	3.6E-04	2.0E-04	3.6E-04
42 DOW CHEMICAL	LEDYARD	CT	0.0E+00	0.0E+00	1.0E-04	1.8E-04	1.0E-04	1.8E-04
43 DOW CHEMICAL	PITTSBURG	CA	0.0E+00	0.0E+00	1.6E-03	2.9E-03	1.6E-03	2.9E-03
44 DOW CHEMICAL USA	FREEPORT	TX	2.8E+02	5.1E+02	5.2E+00	5.2E+00	5.2E+00	5.2E+00
45 DOW CORNING	MIDLAND	MI	7.6E-02	1.4E-01	3.0E-01	5.4E-01	3.0E-01	5.4E-01
46 DSM CHEMICALS	AUGUSTA	GA	0.0E+00	0.0E+00	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
47 DUPONT	LUGOFF	SC	0.0E+00	0.0E+00	1.0E-04	1.8E-04	1.0E-04	1.8E-04
48 DUPONT	DEEPWATER	NJ	6.5E-01	1.2E+00	5.6E-01	1.0E+00	5.6E-01	1.0E+00
49 DUPONT	GIBBSTOWN	NJ	6.5E-01	1.2E+00	1.3E-01	2.4E-01	1.3E-01	2.4E-01
50 DUPONT	BEAUMONT	TX	1.2E+02	2.2E+02	9.0E+01	1.6E+02	9.0E+01	1.6E+00
51 E I DUPONT DE NEMOUR	ORANGE	TX	1.4E+01	2.4E+01	9.9E+00	1.8E+01	9.9E-02	1.8E-01
52 EASTMAN KODAK	ROCHESTER	NY	0.0E+00	0.0E+00	1.7E-03	3.1E-03	1.7E-03	3.1E-03
53 EASTMAN KODAK, INC.	LONGVIEW	TX	4.6E+00	8.3E+00	3.6E+00	6.4E+00	3.6E+00	6.4E+00
54 ETHYL CORP.	BATON ROUGE	LA	0.0E+00	0.0E+00	1.5E-03	2.7E-03	1.5E-03	2.7E-03
55 E.I. DUPONT	PARKERSBURG	WV	0.0E+00	0.0E+00	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
56 FIRST CHEMICAL CORP	PASCAGOULA	MS	1.3E+01	2.4E+01	9.8E+00	1.8E+01	9.8E-02	1.8E-01
57 FMC CORP.	BALTIMORE	MD	8.2E-01	1.5E+00	8.0E-01	1.4E+00	8.0E-01	1.4E+00
58 GAF CORP.	CALVERT CITY	KY	0.0E+00	0.0E+00	5.7E-03	1.0E-02	5.7E-03	1.0E-02
59 GENERAL ELECTRIC	WATERFORD	NY	2.4E+00	4.3E+00	9.5E-01	1.7E+00	9.5E-01	1.7E+00
60 GEORGIA GULF CORP.	PASADENA	TX	1.0E+01	1.8E+01	1.1E+00	2.0E+00	5.6E-02	1.0E-01
61 GEORGIA-PACIFIC CORP	PLAQUEMINE	LA	0.0E+00	0.0E+00	5.2E-02	9.5E-02	5.2E-02	9.5E-02

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TABLE 5-1. BENZENE EMISSION ESTIMATES FOR CHEMICAL PLANTS

No. PLANT	CITY	ST	AQUEOUS (a) BENZENE (Mg/yr)		BASELINE EMISSIONS (Mg/yr)		CONTROLLED EMISSIONS (Mg/yr)		
			MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	
62	GEORGIA-PACIFIC CORP	PASADENA	TX	0.0E+00	0.0E+00	1.9E+00	3.5E+00	1.9E+00	3.5E+00
63	GLIDDEN COATINGS	CARROLLTON	TX	0.0E+00	0.0E+00	1.1E-03	2.0E-03	1.1E-03	2.0E-03
64	GOODRICH, (B.F.)	HENRY	IL	6.0E-03	1.1E-02	1.8E-01	3.3E-01	1.8E-01	3.3E-01
65	GOODYEAR TIRE	BEAUMONT	TX	1.0E-03	1.8E-03	7.0E-04	1.3E-03	7.0E-04	1.3E-03
66	GOODYEAR TIRE & RUBB	LAPORTE	TX	0.0E+00	0.0E+00	5.9E-03	1.1E-02	5.9E-03	1.1E-02
67	GREAT LAKES CHEMICAL	EL DORADO	AR	0.0E+00	0.0E+00	1.4E-03	2.5E-03	1.4E-03	2.5E-03
68	HEAT ENERGY TECH.	DALLAS	TX	0.0E+00	0.0E+00	1.2E-01	2.2E-01	1.2E-01	2.2E-01
69	HERCULES	GIBBSTOWN	NJ	1.6E-01	2.8E-01	1.0E-04	1.8E-04	1.0E-04	1.8E-04
70	HERCULES	MAGNA	UT	0.0E+00	0.0E+00	9.9E-02	1.8E-01	9.9E-02	1.8E-01
71	INT'L FLAVORS & FRAG	UNION BEACH	NJ	1.7E+00	3.1E+00	1.2E+00	2.2E+00	1.2E+00	2.2E+00
72	KERR-MCGEE CHEM. COR	MERIDIAN	MS	1.4E-02	2.5E-02	1.3E-02	2.4E-02	1.3E-02	2.4E-02
73	KOCH INDUSTRIES-CHEMICALS	CORPUS CHRISTI	TX	4.0E-03	7.2E-03	3.2E-02	5.7E-02	3.2E-02	5.7E-02
74	KOPPERS	HOUSTON	TX	2.1E-02	3.8E-02	1.6E-02	2.9E-02	1.6E-02	2.9E-02
75	KOPPERS CO INC	BRIDGEVILLE	PA	1.3E-01	2.3E-01	9.4E-02	1.7E-01	9.4E-02	1.7E-01
76	LILLY COATINGS	MONTEBELLO	CA	0.0E+00	0.0E+00	2.0E-02	3.7E-02	2.0E-02	3.7E-02
77	LILLY IND. COATINGS	DALLAS	TX	0.0E+00	0.0E+00	2.0E-04	3.6E-04	2.0E-04	3.6E-04
78	MALLINCKRODT CHEM.	RALEIGH	NC	0.0E+00	0.0E+00	4.1E-03	7.4E-03	4.1E-03	7.4E-03
79	MARISOL INC.	MIDDLESEX	NJ	8.0E-03	1.4E-02	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
80	MEAD JOHNSON	EVANSVILLE	IN	0.0E+00	0.0E+00	4.0E-04	7.2E-04	4.0E-04	7.2E-04
81	MINE SAFETY APPL.	EVANS CITY	PA	0.0E+00	0.0E+00	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
82	MOBAY CHEMICAL CORP	NEW MARTINSVILLE	WV	1.0E+02	1.9E+02	7.6E+01	1.4E+02	7.6E+01	1.4E+02
83	MOBAY CORP.	HALEDON	NJ	6.1E-02	1.1E-01	4.4E-02	8.0E-02	4.4E-02	8.0E-02
84	MOBIL CHEMICALS	BEAUMONT	TX	3.6E+01	6.5E+01	2.3E-02	4.2E-02	1.2E-03	2.2E-03
85	MONSANTO CO	SAUGET	IL	0.0E+00	0.0E+00	1.0E-04	1.8E-04	1.0E-04	1.8E-04
86	MONSANTO CO	ST. LOUIS	MO	3.4E-02	6.1E-02	2.5E-02	4.5E-02	2.5E-02	4.5E-02
87	MONSANTO CO	ADDYSTON	OH	3.8E-02	6.8E-02	2.8E-02	5.0E-02	2.8E-02	5.0E-02
88	MONSANTO CO	ALVIN	TX	1.3E+02	2.4E+02	9.8E+01	1.8E+02	1.1E+00	2.0E+00
89	MONSANTO CO	BRIDGEPORT	NJ	5.6E-01	1.0E+00	3.5E-01	6.3E-01	3.5E-01	6.3E-01
90	MONSANTO CO	ANNISTON	AL	0.0E+00	0.0E+00	1.4E-02	2.6E-02	1.4E-02	2.6E-02
91	MONTRORSE CHEMICAL CO	HENDERSON	NV	5.0E+00	8.9E+00	4.7E+00	8.4E+00	4.7E+00	8.4E+00
92	NEPERA CHEMICAL CO.,	HARRIMAN	NY	1.0E+01	1.8E+01	1.1E+00	2.0E+00	5.6E-02	1.0E-01
93	NIPRO, INC.	AUGUSTA	GA	8.0E-02	1.4E-01	7.5E-02	1.3E-01	7.5E-02	1.3E-01
94	NORCHEM CO.	CLINTON	IA	0.0E+00	0.0E+00	4.5E-03	8.1E-03	4.5E-03	8.1E-03
95	NORCHEM, INC.	MORRIS	IL	0.0E+00	0.0E+00	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
96	OLIN CHEMICALS	AUGUSTA	GA	0.0E+00	0.0E+00	1.1E-03	2.0E-03	1.1E-03	2.0E-03
97	OLIN CORP.	ST. MARKS	FL	3.0E-03	5.4E-03	1.2E-01	2.2E-01	1.2E-01	2.2E-01
98	ORBIS PRODUCTS CORP	NEWARK	NJ	0.0E+00	0.0E+00	6.0E-04	1.1E-03	6.0E-04	1.1E-03
99	ORTHO DIAGNOSTICS	RARITAN	NJ	0.0E+00	0.0E+00	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
100	PARKE-DAVIS	HOLLAND	MI	7.0E+01	1.3E+02	5.1E+01	9.2E+01	5.1E+01	9.2E+01
101	PPG INDUSTRIES	DELAWARE	OH	0.0E+00	0.0E+00	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
102	PPG INDUSTRIES	NORTON	OH	0.0E+00	0.0E+00	1.0E-04	1.8E-04	1.0E-04	1.8E-04
103	REICHOLD CHEMICALS	GULFPORT	MS	0.0E+00	0.0E+00	6.1E-02	1.1E-01	6.1E-02	1.1E-01
104	REICHOLD CHEMICALS	ELIZABETH	NJ	6.0E-02	1.1E-01	4.4E-02	7.9E-02	4.4E-02	7.9E-02
105	REILLY TAR AND CHEMI	GRANITE CITY	IL	8.0E-03	1.4E-02	5.8E-03	1.0E-02	5.8E-03	1.0E-02
106	REILLY TAR AND CHEMI	INDIANAPOLIS	IN	4.0E+00	7.2E+00	3.0E+00	5.5E+00	3.0E+00	5.5E+00
107	RHONE-POULENC, INC.	MT. PLEASANT	TN	1.2E-01	2.3E-01	9.8E-02	1.8E-01	9.8E-02	1.8E-01
108	RUBICON CHEMICALS IN	GEISMAR	LA	3.6E-01	6.5E-01	2.8E-01	5.1E-01	2.8E-01	5.1E-01
109	SOUTHLAND CORP.	GREAT MEADOWS	NJ	1.8E+01	3.2E+01	1.3E+01	2.4E+01	2.0E-01	3.6E-01
110	STANDARD CHLORIDE CH	DELAWARE CITY	DE	6.1E+01	1.1E+02	4.4E+01	8.0E+01	4.5E-01	8.0E-01
111	STAUFFER CHEMICAL	BATON ROUGE	LA	0.0E+00	0.0E+00	6.2E-03	1.1E-02	6.2E-03	1.1E-02
112	STAUFFER CHEMICAL CO	EDISON	NJ	1.7E+01	3.1E+01	1.2E+01	2.2E+01	1.2E-01	2.2E-01
113	STEPAN CO.	ELWOOD	IL	0.0E+00	0.0E+00	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
114	S.D.S. BIOTECH CORP.	HOUSTON	TX	0.0E+00	0.0E+00	3.9E-02	7.0E-02	3.9E-02	7.0E-02
115	TREMCO INC.	BARBOURVILLE	KY	0.0E+00	0.0E+00	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
116	TROY CHEMICAL CORP.,	NEWARK	NJ	0.0E+00	0.0E+00	5.4E-02	9.7E-02	5.4E-02	9.7E-02
117	UNION CARBIDE	PENUELAS	PR	5.5E-02	1.0E-01	5.2E-02	9.4E-02	5.2E-02	9.4E-02
118	UNION CARBIDE	SEADRIFT	TX	5.0E-03	9.0E-03	6.9E-03	1.2E-02	6.9E-03	1.2E-02
119	UNION CARBIDE CARIBE	PONCE	PR	4.1E+01	7.4E+01	3.8E+01	6.9E+01	3.8E-01	6.9E-01
120	UNION CARBIDE CORP	TEXAS CITY	TX	5.5E+01	9.8E+01	4.0E+01	7.2E+01	4.0E-01	7.2E-01
121	UNION CARBIDE CORP.	HAHNVILLE	LA	8.0E-03	1.4E-02	9.8E-03	1.8E-02	9.8E-03	1.8E-02
122	UPJOHN CO	LA PORTE	TX	1.0E-02	1.8E-02	7.3E-03	1.3E-02	7.3E-03	1.3E-02

TABLE 5-1. BENZENE EMISSION ESTIMATES FOR CHEMICAL PLANTS

No. PLANT	CITY	ST	AQUEOUS (a) BENZENE (Mg/yr)		BASELINE EMISSIONS (Mg/yr)		CONTROLLED EMISSIONS (Mg/yr)	
			MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
123 UPJOHN CO., THE	NORTH HAVEN	CT	1.2E-02	2.2E-02	1.8E-02	3.3E-02	1.8E-02	3.3E-02
124 US ARMY MUNITIONS	KINGSTON	TN	0.0E+00	0.0E+00	6.0E-04	1.1E-03	6.0E-04	1.1E-03
125 US INDUSTRIAL CHEM.	TUSCOLA	IL	0.0E+00	0.0E+00	8.0E-04	1.4E-03	8.0E-04	1.4E-03
126 USS CHEMICAL	IRONTON	OH	0.0E+00	0.0E+00	4.3E-03	7.7E-03	4.3E-03	7.7E-03
127 USS CHEMICALS	FLORENCE	KY	0.0E+00	0.0E+00	<1.0E-4	<1.0E-4	<1.0E-4	<1.0E-4
128 VISTA CHEMICAL	WESTLAKE	LA	1.5E-01	2.7E-01	4.4E-02	7.8E-02	4.4E-02	7.8E-02
129 VISTA CHEMICAL	BALTIMORE	MD	4.2E+02	7.6E+02	4.0E+00	7.3E+00	4.7E-01	8.5E-01
130 VULCAN MATERIALS	WICHITA	KS	2.2E+01	4.1E+01	2.5E+00	4.5E+00	1.2E-01	2.2E-01
131 WITCO CHEMICAL CORPO	POINT COMFORT	TX	5.6E+00	1.0E+01	1.4E+00	2.4E+00	1.4E+00	2.4E+00
132 WITCO CHEMICAL CORP.	OILDALE	CA	1.8E+02	3.3E+02	1.3E+02	2.4E+02	1.3E+00	2.4E+00

(a) Aqueous benzene - quantity of benzene in aqueous wastes (over 10 percent water).

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a range of 66 to 72 waste streams had a benzene concentration of 10 ppm or more and would require control. The number of waste streams is based on an average of approximately 3 benzene waste streams per facility from EPA's data base.

6.0 COST ESTIMATES

The major revisions to the cost estimates include the costs associated with steam stripping and the much larger quantities of wastes that are expected to be controlled, based on the revised estimates presented in the previous sections. The cost estimate for steam stripping was revised to use the updated estimate presented in the CTC document for control of volatile organic compound emissions from industrial wastewater treatment.¹⁴ The steam stripper design and cost estimates include a storage tank with a retention time of 48 hours (where solids may settle or a separate organic layer can be removed), 1,500 meters of piping to transport various wastewater streams to the centrally located steam stripper, and 0.06 kg of steam per liter of wastewater. The steam stripper is designed to remove virtually 100 percent of the highly volatile compounds in the wastewater. (Benzene was used as the controlling compound for design purposes.) The capital cost for a steam stripper processing 130,000 Mg/yr of wastewater was estimated as \$4.70/Mg of wastewater and the total annual cost was estimated as \$1.70/Mg of wastewater.¹⁴

The cost estimates include controls for submerged filling of containers, 95-percent control devices for tanks, steam stripping of wastewater, thin-film evaporation for sludges, and incineration of

organic liquids and solids. Costs are not included for sludges from the petroleum refining industry (RCRA waste codes K048-K052). These sludges are expected to be treated for benzene removal as a result of OSW's land disposal restrictions, and no significant additional costs are expected as a result of the NESHAP for benzene waste operations. Additional details on these cost estimates are provided in Appendix E. The controls are applied only to those facilities with 10 Mg/yr or more benzene in aqueous wastes, and to all waste streams (both aqueous and organic) at these facilities with a benzene concentration of 10 ppm or more. The revised analysis projects that a range of 82 to 197 facilities may be required to install controls for a range of 1,000 to 3,500 individual waste streams that contain benzene. The total quantity of benzene-containing waste to be controlled is estimated to range from 21 to 76 million Mg/yr. The vast majority of this quantity of waste is wastewater that is projected to be steam stripped (20 to 75 million Mg/yr).

The estimated costs are summarized in Table 6-1. The midrange nationwide capital cost is estimated as approximately \$250 million. The midrange total annual cost is estimated as \$87 million/yr.

7. SUMMARY OF NATIONWIDE IMPACTS

The nationwide impacts for the benzene waste NESHAP are summarized in Table 7.1. To estimate health impacts, the minimum and maximum emission estimates for the baseline and controlled cases were modeled for each plant using EPA's Human Exposure Model (HEM). Details on the HEM inputs and the results for maximum risk and incidence are given in Appendix D.

TABLE 6-1. SUMMARY OF WASTE QUANTITIES AND TOTAL NATIONWIDE COSTS (1986 DOLLARS)

	Containers	Tanks	Wastewater	Sludges	Organic Liquids, Solids	Total
Benzene waste quantity (1,000 Mg/yr)	1.6	690	48,000 ^a	248 ^b	12	49,000
Capital cost factor (\$/Mg) ^c	0.83	4.11	4.70 ^d	88	--	--
Capital cost (\$ million)	0.001	2.8	228	17	--	250
Annual cost factor (\$/Mg) ^c	0.15	2.57	1.70 ^d	14.16	35	--
Total annual cost (\$ million/yr)	0.0002	1.8	81.6	3.5	0.4	87

^a Midrange value from an estimated total quantity of 20 to 75 million Mg/yr.

^b Sludges from the petroleum refining industry (K048-K052) are not included in this total. These sludges are expected to be treated for benzene removal as a result of OSW's land disposal restrictions, and no significant additional costs are expected as a result of the NESHAP for benzene waste operations.

^c Cost factors were developed as described in Appendix E except for steam stripping of wastewater (Reference 14).

^d Reference 14.

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TABLE 7-1. SUMMARY OF NATIONWIDE IMPACTS^a

Impact	Baseline	Controlled ^b
Benzene emissions (Mg/yr)	2,020-9,700 (5,900)	216 - 690 (450)
Incidence (deaths/yr)	0.2 - 1 (0.6)	0.02 - 0.07 (0.05)
Maximum risk	$1 \times 10^{-3} - 2 \times 10^{-3}$ (2×10^{-3})	$4 \times 10^{-5} - 8 \times 10^{-5}$ (5×10^{-5})
Capital cost (\$ million)	--	250
Total annual cost (\$ million/yr)	--	87
Quantity of waste controlled (million Mg/yr)	--	21 - 76 (49)
Number of facilities affected ^c	--	82 - 197 (140)
Number of waste streams affected ^d	--	1,000 - 3,500 (2,300)

^a Estimates are presented as ranges with midrange values in parentheses.

^b Controls are applied to all benzene-containing wastes with 10 ppm or more benzene at facilities with 10 Mg/yr or more benzene in their aqueous wastes.

^c Number of facilities in data base of 398 plants with 10 Mg/yr or more benzene in aqueous wastes.

^d Number of benzene-containing waste streams with 10 ppm or more benzene at the affected facilities.

Benzene emissions of 2,020 to 9,700 Mg/yr for the baseline are expected to be reduced to 216 to 690 Mg/yr. These estimates are obtained from summing the minimum and maximum estimates for the four industry categories given in the preceding sections. The range presented for maximum risk is based on the highest risk from the HEM for each of the 4 cases that were modeled (minimum and maximum emissions for the baseline and after control).

Table 7-2 presents the population exposed at each risk level. These values were estimated from the midrange of the population exposures given in Appendix D from the HEM and are rounded to one significant figure.

8. SITE-SPECIFIC ANALYSES

A more detailed examination was made for several plants to evaluate the modeling approach described in the preceding sections and to place bounds on the overall uncertainty in the estimates. Results of the detailed analysis are then compared to the results estimated for these plants from the general approach described in previous sections. The more detailed approach was to develop lower and upper bound estimates based on the range of benzene concentrations that was reported and to use information on the sites actual waste processing scheme (when available). In addition, emissions from wastewater collection systems were included when the reported waste quantity and benzene concentration were for combined wastewater streams as they entered wastewater treatment.

TABLE 7-2. MIDRANGE RESULTS FOR CUMULATIVE POPULATION EXPOSURE

Risk Level	Population Exposure ^a	
	Baseline	Controlled
$\geq 10^{-3}$	200	0
$\geq 10^{-4}$	10,000	0
$\geq 10^{-5}$	300,000	9,000
$\geq 10^{-6}$	5,000,000	200,000
$\geq 10^{-7}$	70,000,000	4,000,000
Total population modeled	700,000,000	700,000,000

^aCalculated from the midrange value of the population exposures given in Appendix D and rounded to one significant figure.

The results in Tables 8-1 and 8-2 are for two chemical plants that treat two large wastewater streams that contain benzene. The data for waste quantity, range of benzene concentrations, and processing sequence were obtained from responses and processing schematics provided in the survey of hazardous waste generators. The estimates of the fraction of benzene emitted in each process were obtained from Reference 11. At the first plant (Table 8-1), the combined wastewater is processed in a series of tanks that include neutralization, settling, equalization, and biological treatment. Most of the benzene emissions are projected to occur prior to biodegradation, and after the biodegradation unit, benzene emissions are expected to be negligible. The second plant (Table 8-2) processes the combined wastewater in a series of surface impoundments. The wastewater is then pumped into tanks and injected underground.

Plant C in Table 8-3 includes a petroleum refinery and petrochemical plant. The data for waste quantity, range of benzene concentrations, and processing sequence were taken from the survey of hazardous waste generators. The major waste streams include 15.7 million Mg/yr of wastewater and waste oils that contain benzene. To estimate the quantity of benzene that entered the wastewater collection system, a back calculation was performed to account for benzene removed with the waste oil. This approach yielded an estimate of 53 to 1,600 Mg/yr of benzene. The plant reported the quantity of recovered waste oil (listed as Item 3 in Table 8-3) as 62,300 Mg/yr with 1 to 10 percent benzene, which yields a benzene quantity of 623 to 6,230 Mg/yr. This reported range is higher than that estimated from the back calculation

TABLE 8-1. PLANT A

Major benzene waste: combined wastewaters

Quantity: 3,740,000 Mg/yr

Benzene concentration: 10 to 100 ppm

Benzene quantity: 37 to 374 Mg/yr

Fraction emitted in collection system (before wastewaters combined)
= 0.21 to 0.44

Range of benzene emissions from collection system:

lower end = $37/(1-0.21) \times 0.21 = 10$ Mg/yr

upper end = $374/(1-0.44) \times 0.44 = 294$ Mg/yr

Processes	fe ^a	Benzene emissions (Mg/yr)	
		Lower	Upper
collection	0.21 - 0.44	10	294
neutralization	0.0092 ^b	0.3	3.4
settling	0.025 ^c	0.9	9.3
equalization	0.4 ^d	14.4	144
biological treatment	0.12 ^e	2.6	26
settling	e	--	--
adsorption	e	--	--
Total		28	480

a Fractions emitted from Reference 11.

b Use the results for a treatment tank.

c Use the results for a clarifier.

d Based on a nonaerated equalization basin. (If the equalization basin is aerated, fe = 0.99.)

e Approximately 88 percent is biodegraded. Quantity of benzene left after biological treatment is assumed to be negligible.

TABLE 8-2. PLANT B

Major benzene waste: combined wastewaters (K011, K013, D002, P003)

Quantity: 1,290,000 Mg/yr

Benzene concentration: 10 to 100 ppm

Benzene quantity: 13 to 130 Mg/yr

Processes	fe ^a	Benzene Emissions (Mg/yr)	
		Lower	Upper
collection	0.21 - 0.44 ^a	3.5	102
surface impoundments	0.5 - 1.0 ^b	6.5	130
deep well	--	--	--
Total		10	230

a From Reference 11.

b From Appendix C.

TABLE 8-3. PLANT C

Major benzene waste: combined wastewaters (K048, K049, K051, XWWL)

Quantity: 15,700,000 Mg/yr

Benzene concentration: 1 to 10 ppm

Benzene quantity: 16 to 160 Mg/yr

Plant C stated that 10 to 30 percent of the benzene is removed with the water (and 70 to 90 percent is removed with the oil) at the oil-water separator. Estimate the quantity of benzene (in oil and water) that entered the wastewater collection system.

lower end - $16/0.3 = 53 \text{ Mg/yr}$

upper end - $160/0.1 = 1,600 \text{ Mg/yr}$

1. Emissions from collection system:

$53 \times 0.21 = 11 \text{ Mg/yr}$

$1,600 \times 0.44 = 700 \text{ Mg/yr}$

2. Wastewater treatment (Assumes the oil-water separator is covered and has negligible emissions.)

Processes	fe ^a	Benzene emissions (Mg/yr)	
		Lower	Upper
equalization	0.4	6.4	64
sump	0.005	0.05	0.5
flocculation	0.009	0.09	0.9
clarifier	0.025	0.24	2.4
trickle filter	0.4 ^b	3.7	37
biotreatment	0.12	0.66	6.7
	Total	11	110

3. Waste oil (62,300 Mg/yr) containing 1 to 10 percent benzene is processed by gravity separation, coalescing plate separation, and storage in a tank. Use $fe = 0.00065^c$ for 3 tanks in series.

$(62,300) \times 0.01 \times (3 \times 0.00065) = 1.2 \text{ Mg/yr}$

$(62,300) \times 0.10 \times (3 \times 0.00065) = 12 \text{ Mg/yr}$

4. A waste oil from the petrochemical plant (D001) with 1 to 10 percent benzene and 41,600 Mg/yr is processed by phase separation and storage in a tank. Use $fe = 0.00065$ for 2 tanks.

$(41,600) \times 0.01 \times (2 \times 0.00065) = 0.5 \text{ Mg/yr}$

$(41,600) \times 0.1 \times (2 \times 0.00065) = 5.4 \text{ Mg/yr}$

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TABLE 8-3. PLANT C (continued)

5. Total Emissions (Mg/yr)

<u>Lower</u>	<u>Upper</u>
11	700
11	110
1.2	12
<u>0.5</u>	<u>5.4</u>
24	830

- a Fraction emitted, from Reference 11.
- b Use the results for a nonaerated equalization tank.
- c From Appendix C.

(53 to 1,600 Mg/yr of benzene) and suggests that if the waste oil was recovered from the wastewater treatment system, actual benzene emissions from the wastewater system may have been greater than the estimate of 11 to 110 Mg/yr. The overall fraction of the benzene emitted from wastewater collection and treatment for this estimate ranged from approximately 0.4 to 0.5. The oil-water separator was reported to be covered and controlled with negligible benzene emissions. The fractions emitted for the two organic liquid wastes (waste oil) ranged from 0.0013 to 0.002 for two and three tanks in series, respectively.

A more detailed analysis was performed for one coke by-product recovery plant (Plant D in Table 8-4) from data submitted by the company. A large wastewater stream containing a small amount of oil that floats on the water and a heavier tar layer is placed in open settling tanks. The oil is skimmed from the top of the water, and the heavier tar layer is removed from the bottom of the tanks. The separated water layer is pumped to a storage tank that serves as the feed tank for a stripper. The benzene concentration in the water entering the settling tanks was reported (148 ppm), and the concentrations in the oil (123 ppm), water (84 ppm) and tar (2,500 ppm) were reported for the different phases removed from the settling tanks. No data were supplied for the benzene concentrations in the oil and tar that entered with the wastewater. Although the benzene concentration in the tar is very high, it is within the range measured in tar as it is removed from the coke oven gas (1,400 to 4,600 ppm)¹³.

TABLE 8-4. PLANT D

Description: A wastewater stream composed of a small oil phase that floats on the water, a large water phase, and a small tar phase (heavier than water) is processed in open top settling tanks, where the floating oil and tar are removed. The water proceeds to a storage tank that serves as the feed tank for a stripper. Concentration and flow rate data were supplied by the company.

	<u>Oil</u>	<u>Water</u>	<u>Tar</u>
Quantity (gal/min) (Mg/yr)	75 1.5×10^5	1,350 2.7×10^6	50 1×10^5
Concentrations (ppm)			
into settling tank	a	148	a
from settling tank	123	84	2,500
into feed tank	--	59	--
from feed tank	--	80	--
Benzene in (Mg/yr)	18 ^b	400	250 ^b
Benzene loss from water (Mg/yr)	--	180 - 240 ^c	--

^a The benzene concentration in the oil and tar entering the settling tanks was not reported.

^b Based on the outlet concentration of benzene in the oil and tar. The concentration entering with the oil was likely higher because of losses from emissions from the oil floating on the exposed surface of the open top tank.

^c Based on concentration decreases from 148 to 80 ppm and 148 to 59 ppm.

The approach in Table 8-4 to estimate benzene losses includes several conservative assumptions:

- The wastewater is collected and transported in closed piping from the point of generation to the settling tanks. (Assumes there are no open sewers, junction boxes, or sumps in the collection system).
- Benzene emissions from the oil in the settling tank are neglected. (The benzene concentration in the oil leaving the settling tank is assumed to be equal to the concentration in the oil entering the tank.)
- Emissions from the removal, collection, and treatment of the oil and tar and stripping of the benzene are not included.

The resulting emission estimate of 180 to 240 Mg/yr of benzene is based on the total quantity of wastewater and decreases in benzene concentration in the water of 148 to 80 ppm and 148 to 59 ppm. The concentration reported leaving the feed tank (80 ppm) appears to be anomalous when compared to the value entering the tank (59 ppm). This variation may be due to the precision of the analytical method or from inlet and outlet samples that are not related with respect to time. For example, the storage tank volume is 3 million gallons with a residence time of approximately 37 hours. If emissions from the settling tank and feed tank are estimated from the fractions emitted derived for tanks in Appendix C (0.03 to 0.18), total emissions would range from 26 to 144 Mg/yr.

The results from the detailed analyses are compared with the results from the general impacts analysis in Table 8-5. The more

TABLE 8-5. COMPARISON OF ESTIMATES USED FOR IMPACTS ANALYSIS
WITH MORE DETAILED ESTIMATES

Facility	Benzene Emission Estimates (Mg/yr) ^a	
	Impacts Analysis	Detailed Analysis ^b
Plant A	76-140 (108)	28-480 (250)
Plant B	98-180 (139)	10-230 (120)
Plant C	16-140 (78)	24-830 (430)
Plant D	3-42 (23)	180-240 (210)

^a Midrange values are presented in parentheses.

^b From results in Tables 8-1 through 8-4.

detailed analysis yields a wider range in the estimated emissions. However, significant benzene emissions are projected to occur even for the lower end of the range. The general analysis appears to provide a reasonable approximation of the range of benzene emissions.

8. REFERENCES

1. Memorandum. G. Fitzsimons to Docket. Summary of Meeting with American Petroleum Institute. December 11, 1989.
2. Annual Refining Survey. Oil and Gas Journal. 87:(12)68-89, March 20, 1989.
3. U.S. Environmental Protection Agency. VOC Emissions from Petroleum Refinery Wastewater Systems - Background Information for Proposed Standards. EPA-450/3-85-001a. February 1985. p. 3-8 to 3-11.
4. Finelt, S., J. R. Crump. Predict Wastewater Generation. Hydrocarbon Processing. 56:(8) 159-166, August 1977.
5. Hoffman, H. L. Petroleum and Its Products. In Riegel's Handbook of Industrial Chemistry. Van Nostrand Reinhold Co., New York. 1983. p. 495.
6. Docket A-89-06, Item IV-D-59. Comments from Shell Oil Company. November 10, 1989.
7. Docket A-89-06, Item IV-D-46. Comments from Chevron Corporation. November 13, 1989.
8. Brownstein, A. M. Trends in Petrochemical Technology. Petroleum Publishing Co., Tulsa, OK. 1976. p. 18.
9. Howard, P. H., et al. Benzene. Environmental Sources of Contamination, Ambient Levels, and Fate. EPA 500/5-75-005. PB-244 139. December 1974. p. 22.
10. Data extracted from the generators survey and TSDR survey are given in Tables 2-4, B-3, and B-4.
11. U.S. Environmental Protection Agency. Industrial Wastewater Volatile Organic Compound Emissions---Background Information for BACT/LAER Determinations. Control Technology Center. January 1990. Appendix A. Emission Estimates.
12. U.S. Environmental Protection Agency. Development Document for Effluent Limitation Guidelines and Standards for Iron and Steel Manufacturing. Volume II, Cokemaking Subcategory. EPA 440/1-82/024. May 1982. p. 39-59.
13. U.S. Environmental Protection Agency. Benzene Emissions from Coke By-product Recovery Plants - Background Information for Proposed Standards. EPA-450/3-83-016a. May 1984. p. C-21 to C-29.

8. REFERENCES (continued)

14. Reference 11, Chapter 6. Control Cost Analysis of Steam Stripper System.
15. U.S. Environmental Protection Agency. Hazardous Waste TSDF - Background Information for Proposed RCRA Air Emission Standards: Volume II, Appendix D. (Draft). March 1988.
16. U.S. Environmental Protection Agency. Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)--Air Emission Models, Publication No. EPA-450/3-87-026. December 1987.
17. Docket A-89-06, Item IV-D-48. Comments from Chemical Manufacturers Association. November 13, 1989. p. 21.
18. U.S. Environmental Protection Agency. Control Cost and Efficiency Estimates for Hazardous Waste TSDF Organic Air Emission Regulatory Analyses (Draft). Emission Standards Division. Research Triangle Park, NC. April 1988. p. 7-1 to 7-10.
19. Reference 18, p. 8-1 to 8-8.

APPENDIX A

ADDITIONAL DETAILS FOR PETROLEUM REFINERY ESTIMATES

TABLE A-1. PROCESS CAPACITIES FOR PETROLEUM REFINERIES

CAPACITY (1,000 barrels per day) *									
PLANT	CITY	ST	CRUDE OIL	CATALYTIC CRACKING	CATALYTIC REFORMING	VISBREAKING	COKING	NAPHTHA SWEETENING	BENZENE PRODUCTION
AMERADA HESS	PURVIS	MS	30	16	5.8			5.8	
AMERADA-HESS	PORT READING	NJ	0	50					
AMOCO	SALT LAKE CITY	UT	40	18	7.6				
AMOCO	CASPER	WY	40	13.5	7				
AMOCO	WHITING	IN	350	140	85		28.5		13
AMOCO	SAVANNAH	GA	28						
AMOCO	MANDAN	ND	58	26	12.1			16.6	
AMOCO	TEXAS CITY	TX	420	195	160		41		45
AMOCO	YORKTOWN	VA	51	27.5	9.8		13.5		
ANCHOR REF.	MCKITTRICK	CA	10						
ARCO ALASKA	KUPARUK	AK	12						
ARCO ALASKA	PRUDHOE BAY	AK	14						
ARCO PETROLEUM	FERNDALE	WA	162		56		50		
ASHLAND	ASHLAND	KY	213.4	100	52			12	5.4
ASHLAND	ST. PAUL PARK	MN	67.1	23	23.5				
ASHLAND	CANTON	OH	66	25	20				
ATLANTIC REFINING	PHILADELPHIA	PA	125	29	60				
ATLANTIC RICHFIELD	CARSON	CA	214	82	48		56		
BARRETT REF.	THOMAS	OK	13						
BELCHER REF.	MOBILE BAY	AL	14.3						
BERRY PETROLEUM	STEVENS	AK	3.8						
BIG WEST OIL	SALT LAKE CITY	UT	24	5	5				
BLOOMFIELD REFINING	BLOOMFIELD	NM	16.8	5.4	2.8				
BP OIL	BELLE CHASSE	LA	195	89	37.5		21	42	30.3
BP OIL	MARCUS HOOK	PA	171	50	48				
CALCASIEU REFINING	LAKE CHARLES	LA	12						
CALUMET REFINING COM	PRINCETON	LA	4.1						
CANAL REF.	CHURCH POINT	LA	9.9		1.9				
CENEX REF.	LAUREL	MT	40.4	12	12				
CHAMPLIN PETROLEUM C	CORPUS CHRISTI	TX	150	70	52		32	54	5
CHEMOIL	SIGNAL HILL	CA	14.4						
CHEVRON	PASCAGOULA	MS	295	56	90		62		5.5
CHEVRON	EL SEGUNDO	CA	330	60	60				1.5
CHEVRON	PORTLAND	OR	15						
CHEVRON	HONOLULU	HI	48	22				3.5	
CHEVRON	PORT ARTHUR	TX	329	110	67.1		34	67.1	10
CHEVRON	KENAI	AK	22						
CHEVRON	PERTH AMBOY	NJ	80						
CHEVRON	SALT LAKE CITY	UT	45	18	5.5		8.5		
CHEVRON	EL PASO	TX	66	22	25				
CHEVRON	SEATTLE	WA	5						
CHEVRON	RICHMOND	CA	270	63	68				
CHEVRON	PHILADELPHIA	PA	174	53.3	34			34	5.3
CIBRO PETROLEUM	ALBANY	NY	42.8						
CITGO PETROLEUM	LAKE CHARLES	LA	320	150	91		63		
CLARK OIL & REFINING	BLUE ISLAND	IL	64.6	25	30.5				
CLARK OIL & REFINING	HARTFORD	IL	60	26	12		14.5	4	
COASTAL EAGLE PT.	WESTVILLE	NJ	109.3	50	38	10			16
COASTAL REFINING	CORPUS CHRISTI	TX	90.3	18.5	28.5	11	12		18
COLORADO REF.	COMMERCE CITY	CO	28	8	9				
CONOCO	COMMERCE CITY	CO	44	15	7.5				
CONOCO	PONCA CITY	OK	136	46	34.5		20.5		
CONOCO	BILLINGS	MT	48.5	15.5	12.5				
CONOCO	SANTA MARIA	CA	9.5						
CONOCO	WESTLAKE	LA	156.5	40	27.4		53		
CROSS OIL & REFINING	SMACKOVER	AR	6.8						
CROWN CENTRAL	HOUSTON	TX	100	56	36		12.5		4
CRYSEN REFINING	WOODS CROSS	UT	12.5		3				
CRYSTAL REF.	CARSON CITY	MI	4						
DERBY REFINING COMPA	WICHITA	KS	29.9	19	6.5		5.5		
DERBY REF.	EL DORADO	KS	28.5	14.5	4.5				
DIAMOND SHAMROCK	THREE RIVERS	TX	50	19	11				
DIAMOND SHAMROCK	SUNRAY	TX	105	45	29				
EDGINGTON OIL COMPAN	LONG BEACH	CA	41.6						
EL PASO REFINING	EL PASO	TX	21	7	5.6		4		
ERGON REF.	VICKSBURG	MS	16.8						
EXXON	BATON ROUGE	LA	455	155	90		90	2.5	

TABLE A-1. PROCESS CAPACITIES FOR PETROLEUM REFINERIES

PLANT	CITY	ST	CAPACITY (1,000 barrels per day) *					
			CRUDE OIL	CATALYTIC CRACKING	CATALYTIC REFORMING	VISBREAKING	COKING	NAPHTHA SWEETENING
EXXON	BENICIA	CA	128	64	28			22
EXXON	BILLINGS	MT	42	21	10			15.5
EXXON	LINDEN	NJ	130	120	28			19
EXXON	BAYTOWN	TX	493	155	123			23.5
FARMLAND INDUSTRIES	COFFEYVILLE	KS	56.5	23	16		12	
FARMLAND INDUSTRIES	PHILLIPSBURG	KS	26.4		5.3			
FINA OIL	PORT ARTHUR	TX	100	36	34			
FINA OIL	BIG SPRING	TX	55	22	20			
FLETCHER OIL & REFIN	WILMINGTON	CA	26.5	10.5	5			
FRONTIER OIL	CHEYENNE	WY	35	12	6.6		6.6	
GIANT REFINERY	GALLUP	NM	18	7.2	6.8			6.8
GOLDEN WEST REFINING	SANTA FE SPRING	CA	40.6	13.5	19	13.8		12
HAWAII INDEP. REF.	EWA BEACH	HI	81.5		12	13		
HILL PETROLEUM	TEXAS CITY	TX	119.6	43.5	23	19		
HILL PETROLEUM	HOUSTON	TX	67.5	55	11.5			
HILL PETROLEUM	KROTZ SPRINGS	LA	55.3	28	12.5			
HOWELL HYDROCARBONS	SAN ANTONIO	TX	2.8		1			
HUNT REFINING	TUSCALOOSA	AL	44.5		6		10	1.5
HUNTWAY REF.	BENECIA	CA	8.4					
HUNTWAY REF.	WILMINGTON	CA	5.5					
INDIANA FARM BUREAU	MT. VERNON	IN	20.6		4			6
INTERMOUNTAIN REF.	FREDONIA	AZ	5.7					
KERN OIL & REFINING	BAKERSFIELD	CA	20		3			
KERR MCGEE	WYNNEWOOD	OK	43	20	8.5			
KERR MCGEE	COTTON VALLEY	LA	33					
KERR MCGEE	COTTON VALLEY	LA	7.8					
KOCH REFINING	CORPUS CHRISTI	TX	125	40	48.5		12	
KOCH REFINING	ROSEMOUNT	MN	218.5	55	32		58	15
LA GLORIA OIL AND GA	TYLER	TX	55	17	15.7		6	16
LAKESIDE REF.	KALAMAZOO	MI	5.6		1			
LAKETON REFINING	LAKETON	IN	8.3					
LION OIL	EL DORADO	AR	48	18.5	9			
LIQUID ENERGY CORP.	BRIDGEPORT	TX	10					
LITTLE AMERICA REF.	CASPER	WY	22	14	6			3.8
LOUISIANA LAND & EXP	SARALAND	AL	80		21			
LUNDAY-THAGARD CO.	SOUTH GATE	CA	7.7					
LYONDELL PETROCHEMIC	HOUSTON	TX	265	90	110		40	10
MANTUA OIL	THOROFARE	NJ	45					
MAPCO PETROLEUM	MEMPHIS	TN	57	30	10			5
MAPCO PETROLEUM	NORTH POLE	AK	90					
MARATHON PETROLEUM	ROBINSON	IL	195	41	79	4	22	
MARATHON PETROLEUM	TEXAS CITY	TX	69.5	38	9			
MARATHON PETROLEUM	DETROIT	MI	68.5	27	18.5			
MARATHON PETROLEUM	GARYVILLE	LA	255	85	48			
MIDATLANTIC REF.	ST. MARYS	WV	5		1.5			
MOBIL	CHALMETTE	LA	145	51	47		33	
MOBIL	BEAUMONT	TX	275	102	103		29.5	
MOBIL	JOLIET	IL	180	98	46		38	9
MOBIL	TORRANCE	CA	123	63	36		48	16
MOBIL	PAULSBORO	NJ	100	36	23.5		21.5	
MONTANA REFINING COM	GREAT FALLS	MT	6.3	2.1	1			
MURPHY OIL CORPORATI	SUPERIOR	WI	32	11	8			
MURPHY OIL CORPORATI	MEHAUX	LA	92.5	35	23			
NATIONAL COOPERATIVE	MCPHERSON	KS	70.9	20	15		22	14.5
NAVAJO REFINING	ARTESIA	NM	38	14.5	7.8			
NEVADA REF.	TONOPAH	NV	4.5					
NEWMALL REFINING CO.	NEWMALL	CA	18.8		2.5			
OXNARD REF.	OXNARD	CA	4.3					
PACIFIC REF.	HERCULES	CA	52.3		15	12		
PARAMOUNT PET.	PARAMOUNT	CA	42.7		10.5			11
PENNZOIL	ROOSEVELT	UT	8	6	2			
PENNZOIL	SHREVEPORT	LA	46.2		10			
PENNZOIL	ROUSEVILLE	PA	15.7		5.8			
PETRO STAR	NORTH POLE	AK	7					
PHILLIPS	SWEENEY	TX	175	87	36			53
PHILLIPS	BORGER	TX	105	60	26			26.5
PHILLIPS	WOODS CROSS	UT	25	8.4	6			11

TABLE A-1. PROCESS CAPACITIES FOR PETROLEUM REFINERIES

PLANT	CITY	ST	CAPACITY (1,000 barrels per day) *					
			CRUDE OIL	CATALYTIC CRACKING	CATALYTIC REFORMING	VISBREAKING	COCKING	NAPHTHA SWEETENING
PLACID REFINING	PORT ALLEN	LA	47.5	18.5	10			
POWERINE OIL	SANTA FE SPRING	CA	46.6	12.5	8.5		10.4	
PRIDE REFINING	ABILENE	TX	42.8					
QUAKER STATE OIL REF	SMETHPORT	PA	6.5		2.1			
QUAKER STATE OIL REF	NEWELL	WV	10.5		3.4			
ROCK ISLAND REFINING	INDIANAPOLIS	IN	44	19	10			
SAN JOAQUIN REF.	BAKERSFIELD	CA	18			10		
SHELL	MARTINEZ	CA	140	67	28			33
SHELL	DEER PARK	TX	216	65	63			101.5
SHELL	NORCO	LA	215		56		21	57
SHELL	ANACORTES	WA	84	41	25			32
SHELL	WOOD RIVER	IL	274	94	97			64
SHELL	ODESSA	TX	28.6	10.5	11			11
SHELL	WILMINGTON	CA	144	42	24		53	39
SINCLAIR OIL	SINCLAIR	WY	54	21	14.5			
SINCLAIR OIL	TULSA	OK	50	18	12			
SOHIO	FERNOALE	WA	77	25.5	11.8			
SOMERSET REFINERY	SOMERSET	KY	5.5		1			
SOUND REF.	TACOMA	WA	11.9					
SOUTHLAND OIL	LUMBERTON	MS	5.8					
SOUTHLAND OIL	SANDERSVILLE	MS	11					
UTHWESTERN REFININ	CORPUS CHRISTI	TX	104	50	30			6.5
ANDARD OIL OF OHIO	TOLEDO	OH	120.7	55	42		13.7	
STANDARD OIL OF OHIO	LIMA	OH	171	36	53		16.2	30.9
STAR REF.	PORT ARTHUR	TX	250	110	40			
STAR REF.	DELAWARE CITY	DE	140	65	56			3.4
STAR REF.	CONVENT	LA	225	85	40	12		
SUN CO.	TULSA	OK	85	30	24			3.4
SUN CO.	MARCUS HOOK	PA	165	87	39.6			7
SUN CO.	TOLEDO	OH	125	60	45.6			11.4
SUNLAND REF.	BAKERSFIELD	CA	15		1.5			1.5
TESARO ALASKA PETROL	KENAI	AK	72		12			
TEXACO	WILMINGTON	CA	75	28	38		48	
TEXACO	ANACORTES	WA	97	36	21		20	
TEXACO	EL DORADO	KS	78.2	31.5	25		13	24.8
TEXACO	BAKERSFIELD	CA	47		23		11.8	3
TOSCO CORP.	MARTINEZ	CA	126	55	43			
TOTAL PETROLEUM	ARKANSAS CITY	KS	53.6	19	16			
TOTAL PETROLEUM	ALMA	MI	42	18.5	14			
TOTAL PETROLEUM	ARDMORE	OK	60.5	22.5	12			
TRIFINERY	CORPUS CHRISTI	TX	28.5					
UNION OIL OF CALIFOR	RODEO	CA	113		34		50.7	
UNION OIL OF CALIFOR	LEMONT	IL	147	58	29.8		27.9	28.6
UNION OIL OF CALIFOR	WILMINGTON	CA	68	38	14.5		24	3.5
UNION OIL OF CALIFOR	NEDERLAND	TX	120	39	32			10.6
UNITED REF.	WARREN	PA	64.6	20	16			6
UNOCAL	LOS ANGELES	CA	108	47	52	20		
U.S. OIL & REFINING	TACOMA	WA	32.8		6			1
VALERO ENERGY CORP.	CORPUS CHRISTI	TX	20	54				
WITC	OILDALE	CA	10.8					
WITC	BRADFORD	PA	8.5		3.3			
WYOMING REF.	NEWCASTLE	WY	12.5	4	2.8			
YOUNG REF.	DOUGLASVILLE	GA	8.8					

* FROM REFERENCE 2.

TABLE A-2. ESTIMATED WASTE QUANTITIES FOR REFINERY WASTEWATERS

PLANT	CITY	ST	MINIMUM WASTE QUANTITIES (Mg/yr)*				MAXIMUM WASTE QUANTITIES (Mg/yr)*			
			1,2,12	3,4,6,7,8 9,10,11	5	13	1,2,12	3,4,6,7,8 9,10,11	5	13
EXXON	BENICIA	CA	3.5E+05	1.7E+05	8.5E+03	0.0E+00	3.6E+05	2.0E+05	8.5E+03	0.0E+00
EXXON	BILLINGS	MT	1.2E+05	5.7E+04	3.0E+03	0.0E+00	1.2E+05	6.7E+04	3.0E+03	0.0E+00
EXXON	LINDEN	NJ	3.6E+05	2.6E+05	8.5E+03	0.0E+00	3.6E+05	2.9E+05	8.5E+03	0.0E+00
EXXON	BAYTOWN	TX	1.4E+06	5.1E+05	3.7E+04	0.0E+00	1.4E+06	6.3E+05	3.7E+04	0.0E+00
FARMLAND INDUSTRIES	COFFEYVILLE	KS	1.6E+05	1.2E+05	4.9E+03	0.0E+00	1.6E+05	1.3E+05	4.9E+03	0.0E+00
FARMLAND INDUSTRIES	PHILLIPSBURG	KS	7.3E+04	1.5E+04	1.6E+03	0.0E+00	7.4E+04	2.1E+04	1.6E+03	0.0E+00
FINA OIL	PORT ARTHUR	TX	2.8E+05	1.1E+05	1.0E+04	2.8E+04	2.8E+05	1.4E+05	1.0E+04	2.8E+04
FINA OIL	BIG SPRING	TX	1.5E+05	6.4E+04	6.1E+03	1.7E+03	1.5E+05	7.8E+04	6.1E+03	1.7E+03
FLETCHER OIL & REFIN	WILMINGTON	CA	7.3E+04	3.1E+04	1.5E+03	0.0E+00	7.4E+04	3.7E+04	1.5E+03	0.0E+00
FRONTIER OIL	CHEYENNE	WY	9.7E+04	6.6E+04	2.0E+03	0.0E+00	9.7E+04	7.5E+04	2.0E+03	0.0E+00
GIANT REFINERY	GALLUP	NM	5.0E+04	2.1E+04	2.1E+03	0.0E+00	5.0E+04	2.6E+04	2.1E+03	0.0E+00
GOLDEN WEST REFINING	SANTA FE SPRING	CA	1.1E+05	4.5E+04	5.8E+03	0.0E+00	1.1E+05	6.0E+04	5.8E+03	0.0E+00
HAWAII INDEP. REF.	EWA BEACH	HI	2.3E+05	4.6E+04	3.7E+03	0.0E+00	2.3E+05	7.1E+04	3.7E+03	0.0E+00
HILL PETROLEUM	TEXAS CITY	TX	3.3E+05	1.3E+05	7.0E+03	0.0E+00	3.3E+05	1.7E+05	7.0E+03	0.0E+00
HILL PETROLEUM	HOUSTON	TX	1.9E+05	1.2E+05	3.5E+03	5.5E+03	1.9E+05	1.4E+05	3.5E+03	5.5E+03
HILL PETROLEUM	KROTZ SPRINGS	LA	1.5E+05	7.3E+04	3.8E+03	0.0E+00	1.5E+05	8.7E+04	3.8E+03	0.0E+00
HOWELL HYDROCARBONS	SAN ANTONIO	TX	7.8E+03	1.6E+03	3.0E+02	2.8E+03	7.8E+03	2.2E+03	3.0E+02	2.8E+03
HUNT REFINING	TUSCALOOSA	AL	1.2E+05	6.8E+04	1.8E+03	0.0E+00	1.2E+05	7.9E+04	1.8E+03	0.0E+00
HUNTWAY REF.	BENECIA	CA	2.3E+04	4.7E+03	0.0E+00	0.0E+00	2.3E+04	6.7E+03	0.0E+00	0.0E+00
HUNTWAY REF.	WILMINGTON	CA	1.5E+04	3.0E+03	0.0E+00	0.0E+00	1.5E+04	4.4E+03	0.0E+00	0.0E+00
INDIANA FARM BUREAU	MT. VERNON	IN	5.7E+04	1.2E+04	1.2E+03	0.0E+00	5.7E+04	1.7E+04	1.2E+03	0.0E+00
INTERMOUNTAIN REF.	FREDONIA	AZ	1.6E+04	3.2E+03	0.0E+00	0.0E+00	1.6E+04	4.6E+03	0.0E+00	0.0E+00
KERN OIL & REFINING	BAKERSFIELD	CA	5.5E+04	1.1E+04	9.1E+02	0.0E+00	5.6E+04	1.6E+04	9.1E+02	0.0E+00
KERR MCGEE	WYNNEWOOD	OK	1.2E+05	5.4E+04	2.6E+03	0.0E+00	1.2E+05	6.5E+04	2.6E+03	0.0E+00
KERR MCGEE	COTTON VALLEY	LA	9.1E+04	1.8E+04	0.0E+00	0.0E+00	9.2E+04	2.6E+04	0.0E+00	0.0E+00
KERR MCGEE	COTTON VALLEY	LA	2.2E+04	4.3E+03	0.0E+00	0.0E+00	2.2E+04	6.3E+03	0.0E+00	0.0E+00
KOCH REFINING	CORPUS CHRISTI	TX	3.5E+05	1.8E+05	1.5E+04	3.0E+04	3.5E+05	2.1E+05	1.5E+04	3.0E+04
KOCH REFINING	ROSEMOUNT	MN	6.1E+05	4.5E+05	9.7E+03	0.0E+00	6.1E+05	5.1E+05	9.7E+03	0.0E+00
LA GLORIA OIL AND GA	TYLER	TX	1.5E+05	8.3E+04	4.8E+03	0.0E+00	1.5E+05	9.7E+04	4.8E+03	0.0E+00
LAKESIDE REF.	KALAMAZOO	MI	1.6E+04	3.1E+03	3.0E+02	0.0E+00	1.6E+04	4.5E+03	3.0E+02	0.0E+00
LAKETON REFINING	LAKETON	IN	2.3E+04	4.6E+03	0.0E+00	0.0E+00	2.3E+04	6.7E+03	0.0E+00	0.0E+00
LION OIL	EL DORADO	AR	1.3E+05	5.5E+04	2.7E+03	0.0E+00	1.3E+05	6.7E+04	2.7E+03	0.0E+00
LIQUID ENERGY CORP.	BRIDGEPORT	TX	2.8E+04	5.5E+03	0.0E+00	0.0E+00	2.8E+04	8.0E+03	0.0E+00	0.0E+00
LITTLE AMERICA REF.	CASPER	WY	6.1E+04	3.4E+04	1.8E+03	0.0E+00	6.1E+04	3.9E+04	1.8E+03	0.0E+00
LOUISIANA LAND & EXP	SARALAND	AL	2.2E+05	4.4E+04	6.4E+03	0.0E+00	2.2E+05	6.4E+04	6.4E+03	0.0E+00
LUNDAY-THAGARD CO.	SOUTH GATE	CA	2.1E+04	4.3E+03	0.0E+00	0.0E+00	2.1E+04	6.2E+03	0.0E+00	0.0E+00
LYONDELL PETROCHEMIC	HOUSTON	TX	7.3E+05	4.6E+05	3.3E+04	3.0E+04	7.4E+05	5.2E+05	3.3E+04	3.0E+04
MANTUA OIL	THOROFARE	NJ	1.2E+05	2.5E+04	0.0E+00	0.0E+00	1.3E+05	3.6E+04	0.0E+00	0.0E+00
MAPCO PETROLEUM	MEMPHIS	TN	1.6E+05	7.8E+04	3.0E+03	0.0E+00	1.6E+05	9.2E+04	3.0E+03	0.0E+00
MAPCO PETROLEUM	NORTH POLE	AK	2.5E+05	5.0E+04	0.0E+00	6.9E+03	2.5E+05	7.2E+04	0.0E+00	6.9E+03
MARATHON PETROLEUM	ROBINSON	IL	5.4E+05	2.7E+05	2.4E+04	0.0E+00	5.4E+05	3.1E+05	2.4E+04	0.0E+00
MARATHON PETROLEUM	TEXAS CITY	TX	1.9E+05	9.6E+04	2.7E+03	6.9E+03	1.9E+05	1.1E+05	2.7E+03	6.9E+03
MARATHON PETROLEUM	DETROIT	MI	1.9E+05	7.9E+04	5.6E+03	0.0E+00	1.9E+05	9.6E+04	5.6E+03	0.0E+00
MARATHON PETROLEUM	GARYVILLE	LA	7.1E+05	2.7E+05	1.5E+04	0.0E+00	7.1E+05	3.3E+05	1.5E+04	0.0E+00
MIDATLANTIC REF.	ST. MARYS	WV	1.4E+04	2.8E+03	4.6E+02	0.0E+00	1.4E+04	4.0E+03	4.6E+02	0.0E+00
MOBIL	CHALMETTE	LA	4.0E+05	3.0E+05	1.4E+04	1.9E+04	4.0E+05	3.4E+05	1.4E+04	1.9E+04
MOBIL	BEAUMONT	TX	7.6E+05	4.3E+05	3.1E+04	0.0E+00	7.7E+05	5.0E+05	3.1E+04	0.0E+00
MOBIL	JOLIET	IL	5.0E+05	4.1E+05	1.4E+04	0.0E+00	5.0E+05	4.6E+05	1.4E+04	0.0E+00
MOBIL	TORRANCE	CA	3.4E+05	3.7E+05	1.1E+04	0.0E+00	3.4E+05	4.0E+05	1.1E+04	0.0E+00
MOBIL	PAULSBORO	NJ	2.8E+05	2.0E+05	7.2E+03	0.0E+00	2.8E+05	2.3E+05	7.2E+03	0.0E+00
MONTANA REFINING COM	GREAT FALLS	MT	1.7E+04	6.7E+03	3.0E+02	0.0E+00	1.8E+04	8.3E+03	3.0E+02	0.0E+00
MURPHY OIL CORPORATI	SUPERIOR	WI	8.9E+04	3.4E+04	2.4E+03	0.0E+00	8.9E+04	4.2E+04	2.4E+03	0.0E+00
MURPHY OIL CORPORATI	MEHAUX	LA	2.6E+05	1.0E+05	7.0E+03	0.0E+00	2.6E+05	1.3E+05	7.0E+03	0.0E+00
NATIONAL COOPERATIVE	MCPHERSON	KS	2.0E+05	1.7E+05	4.6E+03	0.0E+00	2.0E+05	1.8E+05	4.6E+03	0.0E+00
NAVAJO REFINING	ARTESIA	NM	1.1E+05	4.3E+04	2.4E+03	0.0E+00	1.1E+05	5.3E+04	2.4E+03	0.0E+00
NEVADA REF.	TONOPAH	NV	1.2E+04	2.5E+03	0.0E+00	0.0E+00	1.3E+04	3.6E+03	0.0E+00	0.0E+00
NEWHALL REFINING CO.	NEWHALL	CA	5.2E+04	1.0E+04	7.6E+02	0.0E+00	5.2E+04	1.5E+04	7.6E+02	0.0E+00
OXNARD REF.	OXNARD	CA	1.2E+04	2.4E+03	0.0E+00	0.0E+00	1.2E+04	3.5E+03	0.0E+00	0.0E+00
PACIFIC REF.	HERCULES	CA	1.4E+05	3.0E+04	4.6E+03	0.0E+00	1.5E+05	4.7E+04	4.6E+03	0.0E+00
PARAMOUNT PET.	PARAMOUNT	CA	1.2E+05	2.5E+04	3.2E+03	0.0E+00	1.2E+05	3.5E+04	3.2E+03	0.0E+00
PENNZOIL	ROOSEVELT	UT	2.2E+04	1.4E+04	6.1E+02	0.0E+00	2.2E+04	1.6E+04	6.1E+02	0.0E+00
PENNZOIL	SHREVEPORT	LA	1.3E+05	2.6E+04	3.0E+03	0.0E+00	1.3E+05	3.7E+04	3.0E+03	0.0E+00
PENNZOIL	ROUSEVILLE	PA	4.4E+04	8.7E+03	1.8E+03	0.0E+00	4.4E+04	1.3E+04	1.8E+03	0.0E+00
PETRO STAR	NORTH POLE	AK	1.9E+04	3.9E+03	0.0E+00	0.0E+00	1.9E+04	5.6E+03	0.0E+00	0.0E+00
PHILLIPS	SWEENEY	TX	4.8E+05	2.3E+05	1.1E+04	1.6E+04	4.9E+05	2.8E+05	1.1E+04	1.6E+04
PHILLIPS	BORGER	TX	2.9E+05	1.5E+05	7.9E+03	0.0E+00	2.9E+05	1.8E+05	7.9E+03	0.0E+00
PHILLIPS	WOODS CROSS	UT	6.9E+04	2.8E+04	1.8E+03	0.0E+00	7.0E+04	3.4E+04	1.8E+03	0.0E+00

TABLE A-2. ESTIMATED WASTE QUANTITIES FOR REFINERY WASTEWATERS

PLANT	CITY	ST	MINIMUM WASTE QUANTITIES (Mg/yr)*				MAXIMUM WASTE QUANTITIES (Mg/yr)*			
			1,2,12	3,4,6,7,8 9,10,11	5	13	1,2,12	3,4,6,7,8 9,10,11	5	13
PLACID REFINING	PORT ALLEN	LA	1.3E+05	5.4E+04	3.0E+03	0.0E+00	1.3E+05	6.8E+04	3.0E+03	0.0E+00
POWERLINE OIL	SANTA FE SPRING	CA	1.3E+05	8.9E+04	2.6E+03	0.0E+00	1.3E+05	1.0E+05	2.6E+03	0.0E+00
PRIDE REFINING	ABILENE	TX	1.2E+05	2.4E+04	0.0E+00	0.0E+00	1.2E+05	3.4E+04	0.0E+00	0.0E+00
QUAKER STATE OIL REF	SMETHPORT	PA	1.8E+04	3.6E+03	6.4E+02	0.0E+00	1.8E+04	5.2E+03	6.4E+02	0.0E+00
QUAKER STATE OIL REF	NEWELL	WV	2.9E+04	5.8E+03	1.0E+03	0.0E+00	2.9E+04	8.4E+03	1.0E+03	0.0E+00
ROCK ISLAND REFINING	INDIANAPOLIS	IN	1.2E+05	5.3E+04	3.0E+03	0.0E+00	1.2E+05	6.4E+04	3.0E+03	0.0E+00
SAN JOAQUIN REF.	BAKERSFIELD	CA	5.0E+04	1.1E+04	0.0E+00	0.0E+00	5.0E+04	1.9E+04	0.0E+00	0.0E+00
SHELL	MARTINEZ	CA	3.9E+05	1.8E+05	8.5E+03	0.0E+00	3.9E+05	2.2E+05	8.5E+03	0.0E+00
SHELL	DEER PARK	TX	6.0E+05	2.3E+05	1.9E+04	5.5E+04	6.0E+05	2.8E+05	1.9E+04	5.5E+04
SHELL	NORCO	LA	6.0E+05	2.1E+05	1.7E+04	0.0E+00	6.0E+05	2.7E+05	1.7E+04	0.0E+00
SHELL	ANACORTES	WA	2.3E+05	1.1E+05	7.6E+03	0.0E+00	2.3E+05	1.3E+05	7.6E+03	0.0E+00
SHELL	WOOD RIVER	IL	7.6E+05	3.0E+05	3.0E+04	1.1E+04	7.6E+05	3.7E+05	3.0E+04	1.1E+04
SHELL	ODESSA	TX	7.9E+04	3.3E+04	3.3E+03	1.1E+03	8.0E+04	4.0E+04	3.3E+03	1.1E+03
SHELL	WILMINGTON	CA	4.0E+05	3.7E+05	7.3E+03	0.0E+00	4.0E+05	4.1E+05	7.3E+03	0.0E+00
SINCLAIR OIL	SINCLAIR	WY	1.5E+05	6.2E+04	4.4E+03	0.0E+00	1.5E+05	7.5E+04	4.4E+03	0.0E+00
SINCLAIR OIL	TULSA	OK	1.4E+05	5.5E+04	3.7E+03	0.0E+00	1.4E+05	6.8E+04	3.7E+03	0.0E+00
SOHIO	FERNDALE	WA	2.1E+05	8.1E+04	3.6E+03	0.0E+00	2.1E+05	1.0E+05	3.6E+03	0.0E+00
SOMERSET REFINERY	SOMERSET	KY	1.5E+04	3.0E+03	3.0E+02	0.0E+00	1.5E+04	4.4E+03	3.0E+02	0.0E+00
SOUND REF.	TACOMA	WA	3.3E+04	6.6E+03	0.0E+00	0.0E+00	3.3E+04	9.6E+03	0.0E+00	0.0E+00
SOUTHLAND OIL	LUMBERTON	MS	1.6E+04	3.2E+03	0.0E+00	0.0E+00	1.6E+04	4.7E+03	0.0E+00	0.0E+00
SOUTHLAND OIL	SANDERSVILLE	MS	3.0E+04	6.1E+03	0.0E+00	0.0E+00	3.1E+04	8.8E+03	0.0E+00	0.0E+00
SOUTHWESTERN REFININ	CORPUS CHRISTI	TX	2.9E+05	1.3E+05	9.1E+03	1.8E+04	2.9E+05	1.6E+05	9.1E+03	1.8E+04
STANDARD OIL OF OHIO	TOLEDO	OH	3.3E+05	2.1E+05	1.3E+04	0.0E+00	3.4E+05	2.4E+05	1.3E+04	0.0E+00
STANDARD OIL OF OHIO	LIMA	OH	4.7E+05	2.2E+05	1.6E+04	8.6E+04	4.8E+05	2.6E+05	1.6E+04	8.6E+04
STAR REF.	PORT ARTHUR	TX	6.9E+05	3.1E+05	1.2E+04	0.0E+00	7.0E+05	3.7E+05	1.2E+04	0.0E+00
STAR REF.	DELAWARE CITY	DE	3.9E+05	1.8E+05	1.7E+04	9.4E+03	3.9E+05	2.1E+05	1.7E+04	9.4E+03
STAR REF.	CONVENT	LA	6.2E+05	2.5E+05	1.2E+04	0.0E+00	6.3E+05	3.1E+05	1.2E+04	0.0E+00
SUN CO.	TULSA	OK	2.4E+05	9.3E+04	7.3E+03	9.4E+03	2.4E+05	1.1E+05	7.3E+03	9.4E+03
SUN CO.	MARCUS HOOK	PA	4.6E+05	2.2E+05	1.2E+04	1.9E+04	4.6E+05	2.6E+05	1.2E+04	1.9E+04
SUN CO.	TOLEDO	OH	3.5E+05	1.6E+05	1.4E+04	3.2E+04	3.5E+05	1.9E+05	1.4E+04	3.2E+04
SUNLAND REF.	BAKERSFIELD	CA	4.2E+04	8.4E+03	4.6E+02	0.0E+00	4.2E+04	1.2E+04	4.6E+02	0.0E+00
TESARO ALASKA PETROL	KENAI	AK	2.0E+05	4.0E+04	3.7E+03	0.0E+00	2.0E+05	5.8E+04	3.7E+03	0.0E+00
TEXACO	WILMINGTON	CA	2.1E+05	2.9E+05	1.2E+04	0.0E+00	2.1E+05	3.1E+05	1.2E+04	0.0E+00
TEXACO	ANACORTES	WA	2.7E+05	1.9E+05	6.4E+03	0.0E+00	2.7E+05	2.2E+05	6.4E+03	0.0E+00
TEXACO	EL DORADO	KS	2.2E+05	1.5E+05	7.6E+03	8.3E+03	2.2E+05	1.7E+05	7.6E+03	8.3E+03
TEXACO	BAKERSFIELD	CA	1.3E+05	7.7E+04	7.0E+03	0.0E+00	1.3E+05	8.8E+04	7.0E+03	0.0E+00
TOSCO CORP.	MARTINEZ	CA	3.5E+05	1.5E+05	1.3E+04	0.0E+00	3.5E+05	1.8E+05	1.3E+04	0.0E+00
TOTAL PETROLEUM	ARKANSAS CITY	KS	1.5E+05	5.9E+04	4.9E+03	0.0E+00	1.5E+05	7.2E+04	4.9E+03	0.0E+00
TOTAL PETROLEUM	ALMA	MI	1.2E+05	5.1E+04	4.3E+03	0.0E+00	1.2E+05	6.2E+04	4.3E+03	0.0E+00
TOTAL PETROLEUM	ARDMORE	OK	1.7E+05	6.8E+04	3.7E+03	0.0E+00	1.7E+05	8.3E+04	3.7E+03	0.0E+00
TRIFINERY	CORPUS CHRISTI	TX	7.9E+04	1.6E+04	0.0E+00	0.0E+00	7.9E+04	2.3E+04	0.0E+00	0.0E+00
UNION OIL OF CALIFOR	RODEO	CA	3.1E+05	2.8E+05	1.0E+04	0.0E+00	3.1E+05	3.1E+05	1.0E+04	0.0E+00
UNION OIL OF CALIFOR	LEMONT	IL	4.1E+05	2.9E+05	9.1E+03	9.7E+03	4.1E+05	3.3E+05	9.1E+03	9.7E+03
UNION OIL OF CALIFOR	WILMINGTON	CA	1.9E+05	2.0E+05	4.4E+03	0.0E+00	1.9E+05	2.2E+05	4.4E+03	0.0E+00
UNION OIL OF CALIFOR	NEDERLAND	TX	3.3E+05	1.3E+05	9.7E+03	1.7E+04	3.3E+05	1.6E+05	9.7E+03	1.7E+04
UNITED REF.	WARREN	PA	1.8E+05	6.6E+04	4.9E+03	0.0E+00	1.8E+05	8.2E+04	4.9E+03	0.0E+00
UNOCAL	LOS ANGELES	CA	3.0E+05	1.3E+05	1.6E+04	0.0E+00	3.0E+05	1.7E+05	1.6E+04	0.0E+00
U.S. OIL & REFINING	TACOMA	WA	9.1E+04	1.8E+04	1.8E+03	0.0E+00	9.1E+04	2.6E+04	1.8E+03	0.0E+00
VALERO ENERGY CORP.	CORPUS CHRISTI	TX	5.5E+04	9.3E+04	0.0E+00	0.0E+00	5.6E+04	9.8E+04	0.0E+00	0.0E+00
WITCO	OILDALE	CA	3.0E+04	6.0E+03	0.0E+00	0.0E+00	3.0E+04	8.7E+03	0.0E+00	0.0E+00
WITCO	BRADFORD	PA	2.4E+04	4.7E+03	1.0E+03	0.0E+00	2.4E+04	6.8E+03	1.0E+03	0.0E+00
WYOMING REF.	NEWCASTLE	WY	3.5E+04	1.3E+04	8.5E+02	0.0E+00	3.5E+04	1.6E+04	8.5E+02	0.0E+00
YOUNG REF.	DOUGLASVILLE	GA	2.4E+04	4.9E+03	0.0E+00	0.0E+00	2.5E+04	7.1E+03	0.0E+00	0.0E+00

* WASTE NUMBERS ARE KEYED TO THE WASTES LISTED IN TABLES 2-1 AND 2-2 AND ARE GROUPED BY SIMILAR CONCENTRATION RANGES.

- | | |
|----------------------------|-----------------------------------|
| 1 CRUDE STORAGE | 8 COKING |
| 2 DESALTING | 9 NAPHTHA SWEETENING |
| 3 ATMOSPHERIC DISTILLATION | 10 LIGHT PRODUCT STORAGE (WATER) |
| 4 GAS PROCESSING | 11 LIGHT PRODUCT STORAGE (SLUDGE) |
| 5 CATALYTIC REFORMING | 12 SLOP OIL TANKS |
| 6 CATALYTIC CRACKING | 13 BENZENE PRODUCTION |
| 7 VISBREAKING | |

TABLE A-3. ESTIMATES FOR RCRA SLUDGES

PLANT	CITY	ST	WASTE QUANTITIES (Mg/yr)					EMISSIONS (Mg/yr)	
			K048	K049	K050	K051	K052	MINIMUM	MAXIMUM
BELCHER REF.	MOBILE BAY	AL	1.0E+02	8.2E+01	1.2E+00	3.6E+01	1.2E+00	2.4E-04	2.3E-02
HUNT REFINING	TUSCALOOSA	AL	3.2E+02	2.5E+02	3.7E+00	1.1E+02	3.6E+00	7.3E-04	7.0E-02
LOUISIANA LAND & EXP	SARALAND	AL	5.8E+02	4.6E+02	6.6E+00	2.0E+02	6.5E+00	1.3E-03	1.3E-01
ARCO ALASKA	KUPARUK	AK	8.6E+01	6.8E+01	1.0E+00	3.0E+01	9.7E-01	2.0E-04	1.9E-02
ARCO ALASKA	PRUDHOE BAY	AK	1.0E+02	8.0E+01	1.2E+00	3.5E+01	1.1E+00	2.3E-04	2.2E-02
CHEVRON	KENAI	AK	1.6E+02	1.3E+02	1.8E+00	5.5E+01	1.8E+00	3.6E-04	3.5E-02
MAPCO PETROLEUM	NORTH POLE	AK	6.5E+02	5.1E+02	7.5E+00	2.3E+02	7.3E+00	1.5E-03	1.4E-01
PETRO STAR	NORTH POLE	AK	5.0E+01	4.0E+01	5.8E-01	1.8E+01	5.7E-01	1.2E-04	1.1E-02
TESARO ALASKA PETROL	KENAI	AK	5.2E+02	4.1E+02	6.0E+00	1.8E+02	5.8E+00	1.2E-03	1.1E-01
INTERMOUNTAIN REF.	FREDONIA	AZ	4.1E+01	3.2E+01	4.7E-01	1.4E+01	4.6E-01	9.4E-05	9.0E-03
BERRY PETROLEUM	STEVENS	AK	2.7E+01	2.2E+01	3.2E-01	9.5E+00	3.1E-01	6.3E-05	6.0E-03
CROSS OIL & REFINING	SMACKOVER	AR	4.9E+01	3.9E+01	5.6E-01	1.7E+01	5.5E-01	1.1E-04	1.1E-02
LION OIL	EL DORADO	AR	3.5E+02	2.7E+02	4.0E+00	1.2E+02	3.9E+00	7.9E-04	7.6E-02
ANCHOR REF.	MCKITTRICK	CA	7.2E+01	5.7E+01	8.3E-01	2.5E+01	8.1E-01	1.6E-04	1.6E-02
ATLANTIC RICHFIELD	CARSON	CA	1.5E+03	1.2E+03	1.8E+01	5.4E+02	1.7E+01	3.5E-03	3.4E-01
CHEMOIL	SIGNAL HILL	CA	1.0E+02	8.2E+01	1.2E+00	3.6E+01	1.2E+00	2.4E-04	2.3E-02
CHEVRON	EL SEGUNDO	CA	2.4E+03	1.9E+03	2.7E+01	8.3E+02	2.7E+01	5.4E-03	5.2E-01
CHEVRON	RICHMOND	CA	1.9E+03	1.5E+03	2.2E+01	6.8E+02	2.2E+01	4.5E-03	4.3E-01
CONOCO	SANTA MARIA	CA	6.8E+01	5.4E+01	7.9E-01	2.4E+01	7.7E-01	1.6E-04	1.5E-02
EDGINGTON OIL COMPAN	LONG BEACH	CA	3.0E+02	2.4E+02	3.5E+00	1.0E+02	3.4E+00	6.9E-04	6.6E-02
EXXON	BENICIA	CA	9.2E+02	7.3E+02	1.1E+01	3.2E+02	1.0E+01	2.1E-03	2.0E-01
FLETCHER OIL & REFIN	WILMINGTON	CA	1.9E+02	1.5E+02	2.2E+00	6.6E+01	2.1E+00	4.4E-04	4.2E-02
WITCO CORP.	OILDALE	CA	7.8E+01	6.2E+01	9.0E-01	2.7E+01	8.7E-01	1.8E-04	1.7E-02
GOLDEN WEST REFINING	SANTA FE SPRING	CA	2.9E+02	2.3E+02	3.4E+00	1.0E+02	3.3E+00	6.7E-04	6.4E-02
HUNTWAY REF.	BENICIA	CA	6.0E+01	4.8E+01	7.0E-01	2.1E+01	6.8E-01	1.4E-04	1.3E-02
HUNTWAY REF.	WILMINGTON	CA	4.0E+01	3.1E+01	4.6E-01	1.4E+01	4.5E-01	9.1E-05	8.7E-03
KERN OIL & REFINING	BAKERSFIELD	CA	1.4E+02	1.1E+02	1.7E+00	5.0E+01	1.6E+00	3.3E-04	3.2E-02
LUNDAY-THAGARD CO.	SOUTH GATE	CA	5.5E+01	4.4E+01	6.4E-01	1.9E+01	6.2E-01	1.3E-04	1.2E-02
MOBIL OIL	TORRANCE	CA	8.9E+02	7.0E+02	1.0E+01	3.1E+02	1.0E+01	2.0E-03	1.9E-01
NEWHALL REFINING CO.	NEWHALL	CA	1.4E+02	1.1E+02	1.6E+00	4.7E+01	1.5E+00	3.1E-04	3.0E-02
OXNARD REF.	OXNARD	CA	3.1E+01	2.5E+01	3.6E-01	1.1E+01	3.5E-01	7.1E-05	6.8E-03
PACIFIC REF.	HERCULES	CA	3.8E+02	3.0E+02	4.3E+00	1.3E+02	4.2E+00	8.6E-04	8.3E-02
PARAMOUNT PET.	PARAMOUNT	CA	3.1E+02	2.4E+02	3.5E+00	1.1E+02	3.5E+00	7.0E-04	6.7E-02
POWERINE OIL	SANTA FE SPRING	CA	3.4E+02	2.7E+02	3.9E+00	1.2E+02	3.8E+00	7.7E-04	7.4E-02
SAN JOAQUIN REF.	BAKERSFIELD	CA	1.3E+02	1.0E+02	1.5E+00	4.5E+01	1.5E+00	3.0E-04	2.8E-02
SHELL OIL	MARTINEZ	CA	1.0E+03	8.0E+02	1.2E+01	3.5E+02	1.1E+01	2.3E-03	2.2E-01
SHELL OIL	WILMINGTON	CA	1.0E+03	8.2E+02	1.2E+01	3.6E+02	1.2E+01	2.4E-03	2.3E-01
SUNLAND REF.	BAKERSFIELD	CA	1.1E+02	8.5E+01	1.2E+00	3.8E+01	1.2E+00	2.5E-04	2.4E-02
TEXACO REFINING	BAKERSFIELD	CA	3.4E+02	2.7E+02	3.9E+00	1.2E+02	3.8E+00	7.7E-04	7.4E-02
TEXACO REFINING	WILMINGTON	CA	5.4E+02	4.3E+02	6.2E+00	1.9E+02	6.1E+00	1.2E-03	1.2E-01
TOSCO CORP.	MARTINEZ	CA	9.1E+02	7.2E+02	1.0E+01	3.2E+02	1.0E+01	2.1E-03	2.0E-01
UNION OIL OF CALIFOR	WILMINGTON	CA	4.9E+02	3.9E+02	5.6E+00	1.7E+02	5.5E+00	1.1E-03	1.1E-01
UNOCAL	LOS ANGELES	CA	7.8E+02	6.2E+02	9.0E+00	2.7E+02	8.7E+00	1.8E-03	1.7E-01
UNION OIL OF CALIFOR	RODEO	CA	8.1E+02	6.4E+02	9.4E+00	2.8E+02	9.2E+00	1.9E-03	1.8E-01
COLORADO REF.	COMMERCE CITY	CO	2.0E+02	1.6E+02	2.3E+00	7.0E+01	2.3E+00	4.6E-04	4.4E-02
CONOCO	COMMERCE CITY	CO	3.2E+02	2.5E+02	3.7E+00	1.1E+02	3.6E+00	7.3E-04	7.0E-02
STAR REF.	DELAWARE CITY	DE	1.0E+03	8.0E+02	1.2E+01	3.5E+02	1.1E+01	2.3E-03	2.2E-01
AMOCO	SAVANNAH	GA	2.0E+02	1.6E+02	2.3E+00	7.0E+01	2.3E+00	4.6E-04	4.4E-02
YOUNG REF.	DOUGLASVILLE	GA	6.3E+01	5.0E+01	7.3E-01	2.2E+01	7.1E-01	1.5E-04	1.4E-02
CHEVRON	HONOLULU	HI	3.5E+02	2.7E+02	4.0E+00	1.2E+02	3.9E+00	7.9E-04	7.6E-02
HAWAII INDEP. REF.	EWA BEACH	HI	5.9E+02	4.6E+02	6.8E+00	2.0E+02	6.6E+00	1.3E-03	1.3E-01
CLARK OIL & REFINING	BLUE ISLAND	IL	4.7E+02	3.7E+02	5.4E+00	1.6E+02	5.2E+00	1.1E-03	1.0E-01
CLARK OIL & REF.	HARTFORD	IL	4.3E+02	3.4E+02	5.0E+00	1.5E+02	4.9E+00	9.9E-04	9.5E-02
MARATHON PETROLEUM	ROBINSON	IL	1.4E+03	1.1E+03	1.6E+01	4.9E+02	1.6E+01	3.2E-03	3.1E-01
MOBIL OIL	JOLIET	IL	1.3E+03	1.0E+03	1.5E+01	4.5E+02	1.5E+01	3.0E-03	2.8E-01
SHELL OIL	WOOD RIVER	IL	2.0E+03	1.6E+03	2.3E+01	6.9E+02	2.2E+01	4.5E-03	4.3E-01
UNION OIL OF CALIFOR	LEMONT	IL	1.1E+03	8.4E+02	1.2E+01	3.7E+02	1.2E+01	2.4E-03	2.3E-01
AMOCO CHEMICAL	WHITING	IN	2.5E+03	2.0E+03	2.9E+01	8.8E+02	2.8E+01	5.8E-03	5.5E-01
INDIANA FARM BUREAU	MT. VERNON	IN	1.5E+02	1.2E+02	1.7E+00	5.2E+01	1.7E+00	3.4E-04	3.3E-02
LAKETON REFINING	LAKETON	IN	6.0E+01	4.7E+01	6.3E-01	2.1E+01	6.7E-01	1.4E-04	1.3E-02
ROCK ISLAND REFINING	INDIANAPOLIS	IN	3.2E+02	2.5E+02	3.7E+00	1.1E+02	3.6E+00	7.3E-04	7.0E-02
DERBY REF.	EL DORADO	KS	2.1E+02	1.6E+02	2.4E+00	7.1E+01	2.3E+00	4.7E-04	4.5E-02
DERBY REFINING COMPA	WICHITA	KS	2.2E+02	1.7E+02	2.5E+00	7.5E+01	2.4E+00	4.9E-04	4.7E-02

TABLE A-3. ESTIMATES FOR RCRA SLUDGES

PLANT	CITY	ST	WASTE QUANTITIES (Mg/yr)					EMISSIONS (Mg/yr)	
			K048	K049	K050	K051	K052	MINIMUM	MAXIMUM
FARMLAND INDUSTRIES	COFFEYVILLE	KS	4.1E+02	3.2E+02	4.7E+00	1.4E+02	4.6E+00	9.3E-04	8.9E-02
FARMLAND FACILITIES	PHILLIPSBURG	KS	1.9E+02	1.5E+02	2.2E+00	6.6E+01	2.1E+00	4.4E-04	4.2E-02
NATIONAL COOPERATIVE	MCPHERSON	KS	5.1E+02	4.0E+02	5.9E+00	1.8E+02	5.7E+00	1.2E-03	1.1E-01
TEXACO REFINING	EL DORADO	KS	5.6E+02	4.5E+02	6.5E+00	2.0E+02	6.3E+00	1.3E-03	1.2E-01
TOTAL PETROLEUM	ARKANSAS CITY	KS	3.9E+02	3.1E+02	4.4E+00	1.3E+02	4.3E+00	8.8E-04	8.5E-02
ASHLAND PETROLEUM CO	ASHLAND	KY	1.5E+03	1.2E+03	1.8E+01	5.3E+02	1.7E+01	3.5E-03	3.4E-01
SOMERSET REFINERY	SOMERSET	KY	4.0E+01	3.1E+01	4.6E-01	1.4E+01	4.5E-01	9.1E-05	8.7E-03
PENNZOIL	SHREVEPORT	LA	3.3E+02	2.6E+02	3.8E+00	1.2E+02	3.7E+00	7.6E-04	7.3E-02
CALCASIEU REFINING	LAKE CHARLES	LA	8.6E+01	6.8E+01	1.0E+00	3.0E+01	9.7E-01	2.0E-04	1.9E-02
CALUMET REFINING COM	PRINCETON	LA	3.0E+01	2.3E+01	3.4E-01	1.0E+01	3.3E-01	6.8E-05	6.5E-03
CANAL REF.	CHURCH POINT	LA	7.1E+01	5.6E+01	8.2E-01	2.5E+01	8.0E-01	1.6E-04	1.6E-02
CITGO PETROLEUM	LAKE CHARLES	LA	2.3E+03	1.8E+03	2.7E+01	8.0E+02	2.6E+01	5.3E-03	5.1E-01
CONOCO CHEMICALS	WESTLAKE	LA	1.1E+03	8.9E+02	1.3E+01	3.9E+02	1.3E+01	2.6E-03	2.5E-01
EXXON CORP	BATON ROUGE	LA	3.3E+03	2.6E+03	3.8E+01	1.1E+03	3.7E+01	7.5E-03	7.2E-01
HILL PETROLEUM	KROTZ SPRINGS	LA	4.0E+02	3.2E+02	4.6E+00	1.4E+02	4.5E+00	9.1E-04	8.7E-02
KERR-MCGEE REF.	COTTON VALLEY	LA	2.4E+02	1.9E+02	2.7E+00	8.3E+01	2.7E+00	5.4E-04	5.2E-02
KERR-MCGEE REFINING	COTTON VALLEY	LA	5.6E+01	4.4E+01	6.5E-01	2.0E+01	6.3E-01	1.3E-04	1.2E-02
MARATHON PETROLEUM	GARYVILLE	LA	1.8E+03	1.5E+03	2.1E+01	6.4E+02	2.1E+01	4.2E-03	4.0E-01
MOBIL	CHALMETTE	LA	1.0E+03	8.3E+02	1.2E+01	3.6E+02	1.2E+01	2.4E-03	2.3E-01
MURPHY OIL CORPORATI	MERAUX	LA	6.7E+02	5.3E+02	7.7E+00	2.3E+02	7.5E+00	1.5E-03	1.5E-01
PLACID REFINING	PORT ALLEN	LA	3.4E+02	2.7E+02	3.9E+00	1.2E+02	3.8E+00	7.8E-04	7.5E-02
SHELL CHEM CO	NORCO	LA	1.5E+03	1.2E+03	1.8E+01	5.4E+02	1.7E+01	3.5E-03	3.4E-01
BP OIL	BELLE CHASSE	LA	1.4E+03	1.1E+03	1.6E+01	4.9E+02	1.6E+01	3.2E-03	3.1E-01
STAR REF.	CONVENT	LA	1.6E+03	1.3E+03	1.9E+01	5.6E+02	1.8E+01	3.7E-03	3.6E-01
CRYSTAL REF.	CARSON CITY	MI	2.9E+01	2.3E+01	3.3E-01	1.0E+01	3.2E-01	6.6E-05	6.3E-03
LAKESIDE REF.	KALAMAZOO	MI	4.0E+01	3.2E+01	4.6E-01	1.4E+01	4.5E-01	9.2E-05	8.8E-03
MARATHON PET.	DETROIT	MI	4.9E+02	3.9E+02	5.7E+00	1.7E+02	5.5E+00	1.1E-03	1.1E-01
TOTAL PETROLEUM	ALMA	MI	3.0E+02	2.4E+02	3.5E+00	1.1E+02	3.4E+00	6.9E-04	6.6E-02
KOCH REFINING	ROSEMOUNT	MN	1.6E+03	1.2E+03	1.8E+01	5.5E+02	1.8E+01	3.6E-03	3.5E-01
AMERADA HESS	PURVIS	MS	2.2E+02	1.7E+02	2.5E+00	7.5E+01	2.4E+00	4.9E-04	4.7E-02
CHEVRON	PASCAGOULA	MS	2.1E+03	1.7E+03	2.4E+01	7.4E+02	2.4E+01	4.9E-03	4.7E-01
ERGON REF.	VICKSBURG	MS	1.2E+02	9.6E+01	1.4E+00	4.2E+01	1.4E+00	2.8E-04	2.7E-02
SOUTHLAND OIL	LUMBERTON	MS	4.2E+01	3.3E+01	4.8E-01	1.5E+01	4.7E-01	9.6E-05	9.2E-03
SOUTHLAND OIL	SANDERSVILLE	MS	7.9E+01	6.3E+01	9.1E-01	2.8E+01	8.9E-01	1.8E-04	1.7E-02
CENEX REF.	LAUREL	MT	2.9E+02	2.3E+02	3.4E+00	1.0E+02	3.3E+00	6.7E-04	6.4E-02
CONOCO REFINERY	BILLINGS	MT	3.5E+02	2.8E+02	4.0E+00	1.2E+02	3.9E+00	8.0E-04	7.7E-02
EXXON	BILLINGS	MT	3.0E+02	2.4E+02	3.5E+00	1.1E+02	3.4E+00	6.9E-04	6.6E-02
MONTANA REFINING COM	GREAT FALLS	MT	4.5E+01	3.6E+01	5.2E-01	1.6E+01	5.1E-01	1.0E-04	1.0E-02
NEVADA REF.	TONOPAH	NV	3.2E+01	2.6E+01	3.7E-01	1.1E+01	3.6E-01	7.4E-05	7.1E-03
AMERADA-HESS	PORT READING	NJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CHEVRON	PERTH AMBOY	NJ	5.8E+02	4.6E+02	6.6E+00	2.0E+02	6.5E+00	1.3E-03	1.3E-01
COASTAL EAGLE PT.	WESTVILLE	NJ	7.9E+02	6.2E+02	9.1E+00	2.7E+02	8.9E+00	1.8E-03	1.7E-01
EXXON	LINDEN	NJ	9.4E+02	7.4E+02	1.1E+01	3.2E+02	1.1E+01	2.1E-03	2.1E-01
MANTUA OIL	THOROFARE	NJ	3.2E+02	2.6E+02	3.7E+00	1.1E+02	3.6E+00	7.4E-04	7.1E-02
MOBIL OIL	PAULSBORO	NJ	7.2E+02	5.7E+02	8.3E+00	2.5E+02	8.1E+00	1.6E-03	1.6E-01
BLOOMFIELD REFINING	BLOOMFIELD	NM	1.2E+02	9.6E+01	1.4E+00	4.2E+01	1.4E+00	2.8E-04	2.7E-02
GIANT REFINERY	GALLUP	NM	1.3E+02	1.0E+02	1.5E+00	4.5E+01	1.5E+00	3.0E-04	2.8E-02
NAVAJO REFINING	ARTESIA	NM	2.7E+02	2.2E+02	3.2E+00	9.5E+01	3.1E+00	6.3E-04	6.0E-02
CIBRO PETROLEUM	ALBANY	NY	3.1E+02	2.4E+02	3.6E+00	1.1E+02	3.5E+00	7.1E-04	6.8E-02
AMOCO	MANDAN	ND	4.2E+02	3.3E+02	4.8E+00	1.5E+02	4.7E+00	9.6E-04	9.2E-02
ASHLAND OIL	CANTON	OH	4.8E+02	3.8E+02	5.5E+00	1.6E+02	5.3E+00	1.1E-03	1.0E-01
STANDARD OIL OF OHIO	LIMA	OH	1.2E+03	9.7E+02	1.4E+01	4.3E+02	1.4E+01	2.8E-03	2.7E-01
STANDARD OIL OF OHIO	TOLEDO	OH	8.7E+02	6.9E+02	1.0E+01	3.0E+02	9.8E+00	2.0E-03	1.9E-01
SUN CO.	TOLEDO	OH	9.0E+02	7.1E+02	1.0E+01	3.1E+02	1.0E+01	2.1E-03	2.0E-01
BARRETT REF.	THOMAS	OK	9.4E+01	7.4E+01	1.1E+00	3.2E+01	1.1E+00	2.1E-04	2.1E-02
CONOCO	PONCA CITY	OK	9.8E+02	7.8E+02	1.1E+01	3.4E+02	1.1E+01	2.2E-03	2.1E-01
KERR MCGEE	WYNNEWOOD	OK	3.1E+02	2.5E+02	3.6E+00	1.1E+02	3.5E+00	7.1E-04	6.8E-02
SINCLAIR OIL	TULSA	OK	3.6E+02	2.8E+02	4.2E+00	1.3E+02	4.0E+00	8.2E-04	7.9E-02
SUN REFINING	TULSA	OK	6.1E+02	4.8E+02	7.1E+00	2.1E+02	6.9E+00	1.4E-03	1.3E-01
TOTAL PETROLEUM	ARDMORE	OK	4.4E+02	3.4E+02	5.0E+00	1.5E+02	4.9E+00	1.0E-03	9.6E-02
CHEVRON	PORTLAND	OR	1.1E+02	8.5E+01	1.2E+00	3.8E+01	1.2E+00	2.5E-04	2.4E-02
ATLANTIC REFINING	PHILADELPHIA	PA	9.0E+02	7.1E+02	1.0E+01	3.1E+02	1.0E+01	2.1E-03	2.0E-01

TABLE A-3. ESTIMATES FOR RCRA SLUDGES

PLANT	CITY	ST	WASTE QUANTITIES (Mg/yr)					EMISSIONS (Mg/yr)	
			K048	K049	K050	K051	K052	MINIMUM	MAXIMUM
CHEVRON	PHILADELPHIA	PA	1.3E+03	9.9E+02	1.4E+01	4.4E+02	1.4E+01	2.9E-03	2.7E-01
WETCO CHEMICAL CORP.	BRADFORD	PA	6.1E+01	4.8E+01	7.1E-01	2.1E+01	6.9E-01	1.4E-04	1.3E-02
PETROLEUM COMPANY	ROUSEVILLE	PA	1.1E+02	8.9E+01	1.3E+00	3.9E+01	1.3E+00	2.6E-04	2.5E-02
CENTRAL STATE OIL REF	SMETHPORT	PA	4.7E+01	3.7E+01	5.4E-01	1.6E+01	5.3E-01	1.1E-04	1.0E-02
BETHLEHEM	MARCUS HOOK	PA	1.2E+03	9.7E+02	1.4E+01	4.3E+02	1.4E+01	2.8E-03	2.7E-01
SUN PETROLEUM	MARCUS HOOK	PA	1.2E+03	9.4E+02	1.4E+01	4.1E+02	1.3E+01	2.7E-03	2.6E-01
UNITED REF.	WARREN	PA	4.7E+02	3.7E+02	5.4E+00	1.6E+02	5.2E+00	1.1E-03	1.0E-01
MAPCO PETROLEUM	MEMPHIS	TN	4.1E+02	3.2E+02	4.7E+00	1.4E+02	4.6E+00	9.4E-04	9.0E-02
AMOCO	TEXAS CITY	TX	3.0E+03	2.4E+03	3.5E+01	1.1E+03	3.4E+01	6.9E-03	6.6E-01
CHAMPLIN PETROLEUM C	CORPUS CHRISTI	TX	1.1E+03	8.5E+02	1.2E+01	3.8E+02	1.2E+01	2.5E-03	2.4E-01
CHEVRON	EL PASO	TX	4.8E+02	3.8E+02	5.5E+00	1.6E+02	5.3E+00	1.1E-03	1.0E-01
CHEVRON	PORT ARTHUR	TX	2.4E+03	1.9E+03	2.7E+01	8.2E+02	2.7E+01	5.4E-03	5.2E-01
COASTAL REFINING	CORPUS CHRISTI	TX	6.5E+02	5.1E+02	7.5E+00	2.3E+02	7.3E+00	1.5E-03	1.4E-01
CROWN CENTRAL	HOUSTON	TX	7.2E+02	5.7E+02	8.3E+00	2.5E+02	8.1E+00	1.6E-03	1.6E-01
DIAMOND SHAMROCK	SUNRAY	TX	7.6E+02	6.0E+02	8.7E+00	2.6E+02	8.5E+00	1.7E-03	1.7E-01
DIAMOND SHAMROCK REF	THREE RIVERS	TX	3.6E+02	2.8E+02	4.2E+00	1.3E+02	4.0E+00	8.2E-04	7.9E-02
EL PASO REFINING	EL PASO	TX	1.5E+02	1.2E+02	1.7E+00	5.2E+01	1.7E+00	3.5E-04	3.3E-02
EXXON CORP	BAYTOWN	TX	3.5E+03	2.8E+03	4.1E+01	1.2E+03	4.0E+01	8.1E-03	7.8E-01
FINA OIL	BIG SPRING	TX	4.0E+02	3.1E+02	4.6E+00	1.4E+02	4.5E+00	9.1E-04	8.7E-02
FINA OIL & CHEMICAL	PORT ARTHUR	TX	7.2E+02	5.7E+02	8.3E+00	2.5E+02	8.1E+00	1.6E-03	1.6E-01
HILL PETROLEUM	HOUSTON	TX	4.9E+02	3.8E+02	5.6E+00	1.7E+02	5.5E+00	1.1E-03	1.1E-01
HILL PETROLEUM	TEXAS CITY	TX	8.6E+02	6.8E+02	9.9E+00	3.0E+02	9.7E+00	2.0E-03	1.9E-01
HOELL HYDROCARBONS	SAN ANTONIO	TX	2.0E+01	1.6E+01	2.3E-01	7.0E+00	2.3E-01	4.6E-05	4.4E-03
KOCH INDUSTRIES	CORPUS CHRISTI	TX	9.0E+02	7.1E+02	1.0E+01	3.1E+02	1.0E+01	2.1E-03	2.0E-01
LA GLORIA OIL AND GA	TYLER	TX	4.0E+02	3.1E+02	4.6E+00	1.4E+02	4.5E+00	9.1E-04	8.7E-02
LIQUID ENERGY CORP.	BRIDGEPORT	TX	7.2E+01	5.7E+01	8.3E-01	2.5E+01	8.1E-01	1.6E-04	1.6E-02
LYONDELL PETROCHEMIC	HOUSTON	TX	1.9E+03	1.5E+03	2.2E+01	6.6E+02	2.1E+01	4.4E-03	4.2E-01
MARATHON OIL	TEXAS CITY	TX	5.0E+02	4.0E+02	5.8E+00	1.7E+02	5.6E+00	1.1E-03	1.1E-01
MOBIL OIL	BEAUMONT	TX	2.0E+03	1.6E+03	2.3E+01	6.9E+02	2.2E+01	4.5E-03	4.3E-01
PHILLIPS 66 REFINERY	BORGER	TX	7.6E+02	6.0E+02	8.7E+00	2.6E+02	8.5E+00	1.7E-03	1.7E-01
PHILLIPS	SWEENEY	TX	1.3E+03	1.0E+03	1.5E+01	4.4E+02	1.4E+01	2.9E-03	2.8E-01
PRIDE REFINING	ABILENE	TX	3.1E+02	2.4E+02	3.6E+00	1.1E+02	3.5E+00	7.1E-04	6.8E-02
SHELL OIL	DEER PARK	TX	1.6E+03	1.2E+03	1.8E+01	5.4E+02	1.7E+01	3.6E-03	4.5E-01
SHELL OIL REFINERY	ODESSA	TX	2.1E+02	1.6E+02	2.4E+00	7.2E+01	2.3E+00	4.7E-04	4.5E-02
SOUTHWESTERN REFININ	CORPUS CHRISTI	TX	7.5E+02	5.9E+02	8.6E+00	2.6E+02	8.4E+00	1.7E-03	1.6E-01
STAR REF.	PORT ARTHUR	TX	1.8E+03	1.4E+03	2.1E+01	6.2E+02	2.0E+01	4.1E-03	4.0E-01
TRIFINERY	CORPUS CHRISTI	TX	2.1E+02	1.6E+02	2.4E+00	7.1E+01	2.3E+00	4.7E-04	4.5E-02
UNION OIL OF CALIFOR	NEDERLAND	TX	8.6E+02	6.8E+02	1.0E+01	3.0E+02	9.7E+00	2.0E-03	1.9E-01
VALERO ENERGY CORP.	CORPUS CHRISTI	TX	1.4E+02	1.1E+02	1.7E+00	5.0E+01	1.6E+00	3.3E-04	3.2E-02
AMOCO OIL REFINERY	SALT LAKE CITY	UT	2.9E+02	2.3E+02	3.3E+00	1.0E+02	3.2E+00	6.6E-04	6.3E-02
BIG WEST OIL	SALT LAKE CITY	UT	1.7E+02	1.4E+02	2.0E+00	6.0E+01	1.9E+00	4.0E-04	3.8E-02
CHEVRON	SALT LAKE CITY	UT	3.2E+02	2.6E+02	3.7E+00	1.1E+02	3.6E+00	7.4E-04	7.1E-02
CHRYSEN REFINING	WOODS CROSS	UT	9.0E+01	7.1E+01	1.0E+00	3.1E+01	1.0E+00	2.1E-04	2.0E-02
PENNZOIL	ROOSEVELT	UT	5.8E+01	4.6E+01	6.6E-01	2.0E+01	6.5E-01	1.3E-04	1.3E-02
PHILLIPS 66	WOODS CROSS	UT	1.8E+02	1.4E+02	2.1E+00	6.2E+01	2.0E+00	4.1E-04	4.0E-02
AMOCO OIL REFINERY	YORKTOWN	VA	3.7E+02	2.9E+02	4.2E+00	1.3E+02	4.1E+00	8.4E-04	8.1E-02
ARCO PETROLEUM	FERNDAL	WA	1.2E+03	9.2E+02	1.3E+01	4.0E+02	1.3E+01	2.7E-03	2.6E-01
CHEVRON	SEATTLE	WA	3.6E+01	2.8E+01	4.2E-01	1.3E+01	4.1E-01	8.2E-05	7.9E-03
SHELL OIL	ANACORTES	WA	6.0E+02	4.8E+02	7.0E+00	2.1E+02	6.8E+00	1.4E-03	1.3E-01
SOHIO	FERNDAL	WA	5.5E+02	4.4E+02	6.4E+00	1.9E+02	6.2E+00	1.3E-03	1.2E-01
SOUND REF.	TACOMA	WA	8.6E+01	6.8E+01	9.9E-01	3.0E+01	9.6E-01	2.0E-04	1.9E-02
TEXACO USA	ANACORTES	WA	7.0E+02	5.5E+02	8.1E+00	2.4E+02	7.9E+00	1.6E-03	1.5E-01
U.S. OIL & REFINING	TACOMA	WA	2.4E+02	1.9E+02	2.7E+00	8.2E+01	2.7E+00	5.4E-04	5.2E-02
MIDATLANTIC REF.	S. MARYS	WV	3.6E+01	2.8E+01	4.2E-01	1.3E+01	4.1E-01	8.2E-05	7.9E-03
QUAKER STATE OIL REF	NEWELL	WV	7.6E+01	6.0E+01	8.7E-01	2.6E+01	8.5E-01	1.7E-04	1.7E-02
MURPHY OIL CORPORATI	SUPERIOR	WI	2.3E+02	1.8E+02	2.7E+00	8.0E+01	2.6E+00	5.3E-04	5.1E-02
AMOCO	CASPER	WY	2.9E+02	2.3E+02	3.3E+00	1.0E+02	3.2E+00	6.6E-04	6.3E-02
FRONTIER OIL	CHEYENNE	WY	2.5E+02	2.0E+02	2.9E+00	8.8E+01	2.8E+00	5.8E-04	5.5E-02
LITTLE AMERICA REF.	CASPER	WY	1.6E+02	1.3E+02	1.8E+00	5.5E+01	1.8E+00	3.6E-04	3.5E-02
SINCLAIR OIL	SINCLAIR	WY	3.9E+02	3.1E+02	4.5E+00	1.4E+02	4.4E+00	8.9E-04	8.5E-02
WYOMING REF.	NEWCASTLE	WY	9.0E+01	7.1E+01	1.0E+00	3.1E+01	1.0E+00	2.1E-04	2.0E-02
ASHLAND PETROLEUM	ST. PAUL PARK	MN	4.8E+02	3.8E+02	5.6E+00	1.7E+02	5.4E+00	1.1E-03	1.1E-01

TABLE A-4. CONCENTRATION RANGES FROM GENERATORS SURVEY

RCRA WASTE CODE(S)	WASTE FORM (a)	BENZENE CONCENTRATION RANGE (ppm)	BENZENE WASTE QUANTITY (ton/yr)	PROCESSING SEQUENCE
K048	OS	10 to 100	1.7E+03	IMPOUNDMENT, LANDTREATMENT
K048	OS	1 to 10	9.0E+02	AERATION, TANKS
K048	OS	10 to 100	4.0E+00	WASTEWATER TREATMENT
K048	OS	10 to 100	1.6E+02	WASTEWATER TREATMENT, IMPOUNDMENT
K048	OS	0.01 to 0.1	2.4E+04	WASTEWATER TREATMENT
K048	OS	1 to 10	9.5E+03	IMPOUNDMENT, LANDTREATMENT
K048	OL	10 to 100	1.5E+04	
K048	AL	1 to 10	1.8E+04	WASTEWATER TREATMENT
K048K049K051	IS	1 to 10	1.8E+04	WASTEWATER TREATMENT
K048K050K051	OS	10 to 100	1.8E+04	FILTER, LANDTREAT
K048K050K051	OS	10 to 100	1.8E+04	FILTER, LANDTREAT
K049	OS	1000 to 10000	1.1E+03	LANDTREAT
K049	OS	100 to 500	2.2E+03	LANDTREAT
K049	OS	1 to 10	1.7E+02	OIL SKIM, LANDTREAT
K049	OS	10 to 100	2.1E+03	IMPOUNDMENT, LANDTREATMENT
K049K051	OS	0.1 to 1	6.5E+02	WASTEWATER TREATMENT, LAND TREATMENT
K049K051	OS	1000 to 10000	8.3E+01	TANKS, OIL SKIM, DEWATER, SOLIDIFY, LANDFILL
K050	OS	10 to 100	4.0E+00	LANDTREAT
K050	OS	10 to 100	4.0E+00	LANDTREAT
K050	IS	500 to 1000	1.3E+01	FILTER, CONTAINER, LANDFILL
K051	OS	100 to 500	2.9E+02	DEWATER, LANDTREAT
K051	OS	0.1 to 1	1.5E+02	
K051	OS	10 to 100	2.3E+03	SEPARATOR, LANDTREAT
K051	OS	10 to 100	3.4E+02	LANDTREAT
K051	OS	1 to 10	1.8E+03	IMPOUNDMENT, LANDTREATMENT
K051	OS	1 to 10	4.0E+02	OIL SKIM, LANDTREAT
K051	OS	100 to 500	2.2E+02	SEPARATOR, TANKS
K051	OS	10 to 100	9.0E+00	OIL SKIM
K051	OS	10 to 100	7.0E+02	IMPOUNDMENT, LANDTREATMENT
K051	OS	10 to 100	1.8E+03	LANDTREAT
K051	OS	100 to 500	2.4E+02	WASTEWATER TREATMENT, LAND TREATMENT
K051	OS	10 to 100	1.3E+03	CONTAINERS
K051	OS	10 to 100	1.2E+00	WASTEWATER TREATMENT
K052	OS	1 to 10	1.0E+00	TANK, LAND TREATMENT
K052	OS	1000 to 10000	1.0E+00	TANK

(a) AL = AQUEOUS LIQUID
 OS = ORGANIC SLUDGE
 OL = ORGANIC LIQUID
 IS = INORGANIC SLUDGE

APPENDIX B

ADDITIONAL DETAILS OF ESTIMATES FOR OFFSITE TSDF AND CHEMICAL PLANTS

TABLE B-1. REVISED FRACTIONS EMITTED FOR PROCESSING SEQUENCES
LISTED IN TABLES B-3 AND B-4 (a)

PROCESSING SEQUENCE	FRACTION EMITTED	
	ORGANIC	AQUEOUS
1 CONTAINERS	0.0014	0.0014
2 CONTAINERS, LANDFILL	0.72	0.72
3 CONTAINERS, TANKS	0.0020	0.11
4 CONTAINER, INCINERATION	0.0015	0.0015
5 DEWATERING, FILTRATION	0.0021	0.63
6 IMPOUNDMENT	0.76	0.76
7 IMPOUNDMENT, WWT	0.94	0.94
8 INCINERATION	0.0001	0.0001
9 LAND TREATMENT	0.93	0.93
10 LANDFILL	0.72	0.72
11 SOLIDIFICATION	0.68	0.68
12 SOLIDIFICATION, WASTE PILE	0.68	0.68
13 TANKS	0.00065	0.11
14 TANKS, DEWATER	0.0027	0.67
15 TANKS, IMPOUNDMENT, WWT	0.94	0.94
16 TANKS, IMP., SOL., L. TRT., LANDFILL	0.94	0.94
17 TANKS, INCINERATION	0.00075	0.11
18 TANKS, LANDFILL	0.72	0.75
19 TANKS, SOLIDIFICATION, INCINERATION	0.68	0.72
20 TANKS, SOLIDIFICATION, LANDFILL	0.72	0.75
21 TANKS, SOLIDIFICATION, WASTE PILE	0.68	0.72
22 TANKS, WWT	0.76	0.76
23 TANKS, WWT, IMP., SOL., L.F.	0.99	0.99
24 TANKS, WWT, INCINERATION	0.76	0.76
25 TANKS, WWT, SOL., INCINERATION	0.92	0.92
26 WWT	0.73	0.73
27 WWT, LANDFILL	0.92	0.92

(a) REVISED BASED ON A FRACTION EMITTED OF 0.73 FOR WASTEWATER
TREATMENT INSTEAD OF 0.99. ADDITIONAL DETAILS ARE PROVIDED IN
APPENDIX C.

TABLE B-2. PERCENT CONTROL FOR PROCESSING SEQUENCES
LISTED IN TABLES B-3 AND B-4 (a)

PROCESSING SEQUENCE	PERCENT CONTROL (b)		
	ORGANIC	SLUDGE	AQUEOUS
1 CONTAINERS	65	65	65
2 CONTAINERS, LANDFILL	--	98	--
3 CONTAINERS, TANKS	73	73	95
4 CONTAINER, INCINERATION	60	60	60
5 DEWATERING, FILTRATION	75	75	99
6 IMPOUNDMENT	--	98	99
7 IMPOUNDMENT, WWT	--	--	99
8 INCINERATION	0	0	0
9 LAND TREATMENT	--	98	--
10 LANDFILL	--	98	--
11 SOLIDIFICATION	--	98	--
12 SOLIDIFICATION, WASTE PILE	--	98	--
13 TANKS	95	95	95
14 TANKS, DEWATER	79	79	98
15 TANKS, IMPOUNDMENT, WWT	--	--	99
16 TANKS, IMP., SOL., L. TRT., LANDFILL	--	98	99
17 TANKS, INCINERATION	83	83	95
18 TANKS, LANDFILL	--	98	--
19 TANKS, SOLIDIFICATION, INCINERATION	--	97	--
20 TANKS, SOLIDIFICATION, LANDFILL	--	97	--
21 TANKS, SOLIDIFICATION, WASTE PILE	--	97	--
22 TANKS, WWT	--	98	99
23 TANKS, WWT, IMP., SOL., L.F.	--	98	99
24 TANKS, WWT, INCINERATION	--	98	99
25 TANKS, WWT, SOL., INCINERATION	--	98	99
26 WWT	--	--	99
27 WWT, LANDFILL	--	98	99

(a) Controls include steam stripping for aqueous wastes, thin-film evaporation for sludges, incineration for organic liquids and solids, and submerge-fill for containers. A 95-percent control device is used for all tanks. Additional details are given in Appendix C.

(b) Rounded to 2 significant figures.

TABLE B-3. SURVEY DATA FOR OFF-SITE TSDF

(a) FACILITY	CITY	ST	BENZENE CONCENTRATION wt. fraction(b)	RCRA CODES	WASTE FORM (c)	WASTE QUANTITY (Mg/yr)(d)	PROCESS CODE (e)
T ASHLAND CHEMICAL	BOYD CO.	KY	2.0E-03	4 K048K049K050	AL	1.1E+05	10
G CALLEIA RES. RECOVERY	BROOKLYN	NY	1.0E-03	0000	OL	8.0E+01	17
G CASMALIA RESOURCES	CASMALIA	CA	5.5E-05	XA34	AL	1.0E+04	6
G CECOS	STAMFORD	CT	5.5E-02	D001	OL	2.7E+02	26
G CECOS INT'L	LIVINGSTON	LA	5.0E-08	U044U220U019	AL	6.9E+03	13
G CECOS INT'L	NIAGRA FALLS	NY	1.0E-09		AL	2.6E+04	26
G CECOS INT'L	CINCINNATI	OH	5.5E-03	K031F006K016	AS	9.4E+01	18
G CECOS INT'L	BRISTOL	CT	5.5E-02	D001	OL	2.6E+02	13
T CECOS INT'L	WILLIAMSBURG	OH	4.4E-06	3 K048	OS	7.3E+00	10
T CECOS INT'L	WILLIAMSBURG	OH	3.0E-05	6 K048K051	OS	1.7E+01	10
T CECOS INT'L	WILLIAMSBURG	OH	7.0E-05	12 K051	OS	1.7E+02	10
T CECOS INT'L	WILLIAMSBURG	OH	3.5E-02	45 K083	OL	2.4E+01	10
T CECOS INT'L	WILLIAMSBURG	OH	3.5E-02	45 K083	OL	3.3E+01	10
T CECOS INT'L	WILLIAMSBURG	OH	5.0E-03	46 K085	OS	3.7E+02	10
T CECOS INT'L	WILLIAMSBURG	OH	5.0E-03	46 K085	OS	3.6E+00	10
T CECOS INT'L	WILLIAMSBURG	OH	7.7E-04	15 K104	AL	3.2E+02	10
G CHEMICAL PROCESSORS	SEATTLE	WA	5.5E-03	F005D001F001	OL	3.4E+02	13
T CHEMICAL RESOURCES	TULSA	OK	1.2E-03	7 K049	OS	4.3E+02	13
T CHEM-CLEAR INC.	BALTIMORE	MD	7.0E-05	12 K051	OS	3.7E+02	11
T CHEM-CLEAR INC.	CLEVELAND	OH	7.7E-04	15 K104	AL	3.9E+01	22
T CHEM-MET SERVICES	WYANDOTTE	MI	4.4E-06	3 K048	OS	0.0E+00	10
T CHEM-MET SERVICES	WYANDOTTE	MI	1.2E-03	7 K049	OS	0.0E+00	10
T CHEM-MET SERVICES	WYANDOTTE	MI	7.5E-04	10 K050	IS	2.0E+01	10
T CHEM-MET SERVICES	WYANDOTTE	MI	7.0E-05	12 K051	OS	1.7E+02	10
G CHEM. WASTE MGMT	EMELLE	AL	5.5E-07	XLEA	OL	1.8E+03	13
T CHEM. WASTE MGMT.	CALUMET CITY	IL	4.4E-06	3 K048	OS	8.6E+02	10
T CHEM. WASTE MGMT.	CALUMET CITY	IL	2.0E-03	4 K048K049K050	AL	7.0E+01	10
T CHEM. WASTE MGMT.	CALUMET CITY	IL	6.3E-04	9 K049K051	OS	1.3E+02	10
T CHEM. WASTE MGMT.	CALUMET CITY	IL	7.5E-04	10 K050	IS	4.6E+01	10
T CHEM. WASTE MGMT.	CALUMET CITY	IL	7.0E-05	12 K051	OS	6.2E+03	10
G CID-LANDFILL	CALUMET CITY	IL	5.5E-07	K062	AL	2.9E+04	26
G COMMERCIAL DISPOSAL	CWEST SPRINGFIELD	MA	5.5E-05	F001	OL	4.5E+00	13
G COMMERCIAL DISPOSAL	CWEST SPRINGFIELD	MA	5.7E-02	27 D001	OL	3.0E+00	13
G DELAWARE CONTAINERS	COATSVILLE	PA	5.5E-02	F003F005D001	OL	1.5E+04	17
G DELAWARE CONTAINERS	COATSVILLE	PA	5.5E-02	F003F005D001	OL	1.1E+03	17
G DELAWARE CONTAINERS	COATSVILLE	PA	5.5E-02	F003F005D001	OL	0.0E+00	17
G ECOLOTEC	DAYTON	OH	5.5E-02	33 D002D006D007	AS	1.4E+02	3
T ENSCO	EL DORADO	AR	4.4E-06	3 K048	OS	1.2E+04	25
T ENSCO	EL DORADO	AR	4.4E-06	3 K048	OS	6.8E+02	25
T ENSCO	EL DORADO	AR	4.4E-06	3 K048	OS	1.2E+04	25
T ENVIROSAFE SERVICES	OREGON	OH	2.0E-03	4 K048K049K051	AL	2.3E+01	10
T ENVIROSAFE SERVICES	OREGON	OH	4.4E-06	3 K048	OS	5.5E+01	10
T ENVIROSAFE SERVICES	OREGON	OH	2.0E-03	4 K048K049K050	AL	3.4E+03	10
T ENVIROSAFE SERVICES	OREGON	OH	2.0E-03	4 K048K049K051	AL	1.3E+03	10
T ENVIROSAFE SERVICES	OREGON	OH	1.2E-03	7 K049	OS	2.8E+03	10
T ENVIROSAFE SERVICES	OREGON	OH	1.2E-03	7 K049	OS	2.2E+02	10
T ENVIROSAFE SERVICES	OREGON	OH	7.5E-04	10 K050	IS	3.6E+01	10
T ENVIROSAFE SERVICES	OREGON	OH	7.0E-05	12 K051	OS	2.6E+02	10
T ENVIROSAFE SERVICES	OREGON	OH	7.0E-05	12 K051	OS	1.9E+03	10
T ENVIROSAFE SERVICES	OREGON	OH	5.0E-08	16 U019	AL	9.1E-01	13
T ENVIROSAFE SERVICES	OREGON	OH	5.0E-08	16 U019	AL	2.0E+02	13
T ENVIROSAFE SERVICES	OREGON	OH	5.0E-08	16 U019	AL	9.1E+00	13
T ENVIROSAFE SERVICES	OREGON	OH	5.5E-07	17 U019	AL	1.3E+03	13
G ENV. ENTERPRISES	CINCINNATI	OH	5.5E-02	F001F002F003	OL	1.9E+03	4
T ENV. ENTERPRISES	CINCINNATI	OH	6.4E-01	18 U019	OL	1.5E+03	8
T ENV. WASTE RESOURCES	WATERBURY	CT	7.0E-05	12 K051	OS	3.6E+00	22
T ERIEWAY POLL. CONTROL	BEDFORD	OH	7.5E-05	12 K035K051U019	OS	2.0E+03	12
T ERIEWAY POLL. CONTROL	BEDFORD	OH	5.5E-05	5 K048K050K049	OS	1.3E+04	12
T ERIEWAY POLL. CONTROL	BEDFORD	OH	5.5E-05	5 K048K050K049	OS	2.6E+02	12
T ERIEWAY POLL. CONTROL	BEDFORD	OH	5.5E-05	5 K048K050K049	OS	7.4E+03	12
G FRONTIER CHEMICAL	NIAGRA FALLS	NY	5.5E-05	F001F002F003	AL	8.8E+02	17
G GULF COAST WASTE DISPT	TEXAS CITY	TX	5.5E-07	XLEA	AL	2.5E+02	9
T HANSBROUGH ENERGY	CROWLEY	LA	2.0E-03	4 K048K049K051	AL	1.3E+03	19

TABLE B-3. SURVEY DATA FOR OFF-SITE TSDF

(a) FACILITY	CITY	ST	BENZENE		RCRA	WASTE	WASTE	PROCESS
			CONCENTRATION	wt. fraction(b)				
							(Mg/yr)(d)	
T HANSBROUGH ENERGY	CROWLEY	LA	2.0E-03	4	K048K049K051	AL	1.3E+04	19
T HANSBROUGH ENERGY	CROWLEY	LA	4.4E-06	3	K048	OS	8.4E+02	19
T HANSBROUGH ENERGY	CROWLEY	LA	1.2E-03	7	K049	OS	1.6E+02	19
T HANSBROUGH ENERGY	CROWLEY	LA	7.0E-05	12	K051	OS	2.2E+02	19
T HANSBROUGH ENERGY	CROWLEY	LA	7.0E-05	12	K051	OS	2.3E+02	19
T HERITAGE ENV. SERVICE	INDIANAPOLIS	IN	7.0E-05	12	K051	OS	4.4E+02	24
T INDUSTRIAL WASTE REMOVAL	WISBERRY	PA	7.0E-05	12	K051	OS	7.3E+00	13
T IT CORPORATION	BENECIA	CA	7.0E-05	12	K051	OS	4.4E+02	23
T IT CORPORATION	WESTMORELAND	CA	7.0E-05	12	K051	OS	2.2E+03	7
T IT CORP.-PETROL.	WASTBUTTONWILLOW	CA	1.2E-03	7	K049	OS	4.2E+02	7
T IT CORP.-PETROL.	WASTBUTTONWILLOW	CA	1.2E-03	7	K049	OS	6.0E+01	7
T IT CORP.-PETROL.	WASTBUTTONWILLOW	CA	7.5E-04	10	K050	IS	8.5E+01	7
T IT CORP.-PETROL.	WASTBUTTONWILLOW	CA	7.0E-05	12	K051	OS	2.8E+03	7
T IT CORP.-PETROL.	WASTBUTTONWILLOW	CA	7.0E-05	12	K051	OS	2.0E+01	7
T MALONE SERVICE CO.	TEXAS CITY	TX	5.0E-08	16	U019	AL	1.6E+01	13
T MICHIGAN DISPOSAL	INCBELLEVILLE	MI	6.3E-04	9	K049K051	OS	9.3E+04	12
T MICHIGAN DISPOSAL	INCBELLEVILLE	MI	1.2E-03	7	K049	OS	3.2E+02	12
T MICHIGAN DISPOSAL	INCBELLEVILLE	MI	7.0E-05	12	K051	OS	2.4E+02	12
T PEORIA DISPOSAL CO.	PEORIA	IL	1.2E-03	7	K049	OS	1.9E+01	10
T PETROCHEM RECYCLING	SALT LAKE CITY	UT	6.3E-04	9	K049K051	OS	7.6E+02	22
T PETROCHEM RECYCLING	SALT LAKE CITY	UT	7.0E-05	12	K051	OS	9.5E+01	22
T ROGERS LANDFILL	CENTREVILLE	MS	4.4E-06	3	K048	OS	2.1E+04	9
T ROLLINS ENV. SERVICES	BRIDGEPORT	NJ	5.0E-03	46	K085	OS	2.3E+02	8
T ROLLINS ENV. SERVICES	DEER PARK	TX	6.3E-04	9	K049K051	OS	8.3E+04	20
T ROLLINS ENV. SERVICES	DEER PARK	TX	1.2E-03	7	K049	OS	6.0E+03	20
T ROLLINS ENV. SERVICES	DEER PARK	TX	7.5E-04	10	K050	IS	1.6E+03	10
T ROLLINS ENV. SERVICES	DEER PARK	TX	7.0E-05	12	K051	OS	6.0E+03	20
T ROLLINS ENV. SERVICES	DEER PARK	TX	5.0E-03	46	K085	OS	4.7E+04	8
T SOLVENT RECOV.	SERVICLINDEN	NJ	7.0E-05	12	K051	OS	1.8E-01	1
T SOLVENT RECOV.	SERVICLINDEN	NJ	7.0E-05	12	K051	OS	1.8E-01	1
T SOLVENT RECOV.	SERVICLINDEN	NJ	1.7E-05	18	U019	AL	2.5E+02	13
T TEXAS ECOLOGISTS	ROBSTOWN	TX	1.1E-03	42	K035	OS	7.3E+00	10
T TEXAS ECOLOGISTS	ROBSTOWN	TX	3.0E-05	6	K048K051	OS	4.0E+02	10
T TEXAS ECOLOGISTS	ROBSTOWN	TX	1.2E-03	7	K049	OS	5.0E+02	10
T TEXAS ECOLOGISTS	ROBSTOWN	TX	6.3E-04	9	K049K051	OS	1.8E+03	10
T TEXAS ECOLOGISTS	ROBSTOWN	TX	7.5E-04	10	K050	IS	2.4E+03	10
T TEXAS ECOLOGISTS	ROBSTOWN	TX	7.0E-05	12	K051	OS	4.5E+03	10
T TEXAS ECOLOGISTS	ROBSTOWN	TX	7.0E-05	12	K051	OS	1.2E+01	10
T TEXAS ECOLOGISTS	ROBSTOWN	TX	5.5E-07	17	U019	IS	9.1E-01	10
T TEXAS ECOLOGISTS	ROBSTOWN	TX	5.5E-07	17	U019	IS	5.1E+01	10
T TEXAS ECOLOGISTS	ROBSTOWN	TX	5.5E-07	17	U019	IS	9.1E-01	10
G TRICIL ENV. SERVICES	MUSKEGON HEIGHTS	MI	5.0E-08		F006	AS	1.4E+02	14
T USPCI GRASSY MT.	KNOWLES	UT	1.1E-03	42	K035	OS	1.2E+03	10
T USPCI GRASSY MT.	KNOWLES	UT	6.3E-04	9	K049K051	OS	3.7E+03	16
T WASTE CONVERSION	HATFIELD	PA	1.2E-03	8	K049K050K051	OS	5.3E+04	21
G WASTE TECH SERVICES	GOLDEN	CO	1.0E-03		F024	OS	1.9E+00	8
G WASTE TECH SERVICES	GOLDEN	CO	1.0E-03		D008	OL	1.9E+00	8
G WAYNE DISPOSAL	BELLEVILLE	MI	5.0E-08		XLEA	AL	1.1E+04	13

(a) G = FROM GENERATOR SURVEY

T = FROM TSDF SURVEY

(b) CONCENTRATIONS ARE FROM GENERATORS SURVEY. WHEN A NUMBER (CODE) FOLLOWS, AN AVERAGE CONCENTRATION WAS ESTIMATED AND THE CODE IS KEYED TO TABLE B-5.

(c) WASTE FORMS — AL = AQUEOUS LIQUID
AS = AQUEOUS SLUDGE
OL = ORGANIC LIQUID
OS = ORGANIC SLUDGE
IS = INORGANIC SLUDGE

(d) QUANTITY OF WASTE THAT CONTAINS BENZENE.

(e) CODE FOR PROCESSING UNITS, KEYED TO TABLE B-1.

TABLE B-4. TSDF AND GENERATORS SURVEY DATA FOR CHEMICAL PLANTS

(a) FACILITY	CITY	ST	BENZENE CONCENTRATION		(b)	RCRA CODES	WASTE FORM (c)	WASTE QUANTITY (Mg/yr)(d)	PROCESS CODE (e)
			wt. fraction						
G 3-M COMPANY	COTTAGE GROVE	MN	1.1E-01	30	D001		OL	1.9E+02	4
G 3-M COMPANY	COTTAGE GROVE	MN	9.2E-03	29	D001		OS	6.3E+02	4
G AIR PRODUCTS & CHEM.	WICHITA	KS	5.5E-02	24	D001		OLAL	5.8E+02	17
G ALDRICH CHEMICALS	MILWAUKEE	WI	5.5E-02		D001F003U117		OL	2.5E+02	1
G ALDRICH CHEMICALS	MILWAUKEE	WI	7.5E-04		U211F002U080		OL	3.1E+01	1
G ALDRICH CHEMICALS	MILWAUKEE	WI	5.5E-06	34	D003		OS	1.2E+01	1
T ALLIED CHEMICAL	IRONTON	OH	1.1E-03	42	K035		OS	3.9E+02	1
T ALLIED SIGNAL	BIRMINGHAM	AL	1.8E-05	43	K035		AS	9.1E-01	24
T ALLIED SIGNAL	BIRMINGHAM	AL	1.8E-05	43	K035		AS	2.4E+02	24
G ALPHA CHEMICAL	LAKELAND	FL	1.0E-01	21	D001		OL	1.2E+03	17
G ALPHA RESINS	PERRIS	CA	1.0E-01	21	D001		OL	1.6E+03	17
G AMCHEM PRODUCTS INC.	AMBLER	PA	5.0E-08		D002		OL	9.8E+01	13
G AMERICAN CYANAMID	BRIDGEWATER	NJ	5.7E-02	27	D001		OL	9.1E-01	1
G AMERICAN CYANAMID	BRIDGEWATER	NJ	5.5E-05		X940		IS	4.1E+01	1
G AMOCO CHEMICAL	TEXAS CITY	TX	5.5E-02	23	D001		OL	1.1E+02	1
T ARIS TECH CHEMICAL	HAVERTHILL	OH	3.9E-04	44	K083		AL	4.2E+03	26
G AYERST LABS	ROUSES POINT	NY	5.5E-02		D001F003F005		OL	1.7E+02	1
G BF GOODRICH	AVON LAKE	OH	5.5E-02		F003		OL	1.1E+01	4
G BF GOODRICH	AVON LAKE	OH	5.5E-02		F003		OL	1.6E+01	4
G BF GOODRICH	AVON LAKE	OH	6.3E-01		D001		OS	1.2E+00	4
T BF GOODRICH CHEMICAL	CALVERT CITY	KY	5.5E-07	17	U019		AL	1.5E+01	1
G BROWNING MANUF.	MORGAN	UT	5.5E-03		F005		OL	1.7E+00	1
G CAIN CHEMICAL	BRAZORIA	TX	1.3E-01		D001		AL	1.3E+02	13
T CALGON CARBON	NEVILLE ISLAND	PA	7.7E-04	15	K104		AL	1.9E+03	13
T CELANESE CHEMICAL	BISHOP	TX	5.5E-07	17	U019		AL	5.9E+03	15
G CHATTEM CHEMICALS	CHATTANOOGA	TN	5.5E-07		D001		OL	3.0E+02	13
G CIBA CORNING	MEDFIELD	MA	1.5E-06	28	D001		OLAL	6.1E+00	1
T CIBA-GEIGY	TOMS RIVER	NJ	7.7E-04	15	K104		AL	9.1E-01	1
T COSAN CHEMICAL	CARLSTADT	NJ	5.5E-07	17	U019		AL	9.1E-01	1
G DEVOE & RAYNOLDS	LOUISVILLE	KY	1.0E-09		D001		OL	3.0E+01	1
G DOW CHEMICAL	PLAQUEMAN	LA	3.8E-01		D001		OS	4.0E+01	4
G DOW CHEMICAL	PLAQUEMAN	LA	1.8E-01		D001		OL	5.8E+01	4
G DOW CHEMICAL	PITTSBURG	CA	5.5E-02		F003D001		OL	1.5E+01	1
G DOW CHEMICAL	PITTSBURG	CA	5.5E-02		F002		OL	5.5E+00	1
G DOW CHEMICAL	DALTON	GA	7.5E-04		D001		OL	2.5E+02	28
G DOW CHEMICAL	LEDYARD	CT	7.5E-04		D001		OL	1.3E+02	28
G DOW CORNING	MIDLAND	MI	5.5E-07		D002		AL	1.3E+03	13
G DOW CORNING	MIDLAND	MI	1.8E-01		D001D003		OL	2.2E+03	13
G DOW CORNING	MIDLAND	MI	5.5E-02		D001F003F005		OL	5.7E+01	13
G DOW CORNING	MIDLAND	MI	7.5E-04		F005		IS	1.0E+02	1
G DOW CORNING	MIDLAND	MI	5.5E-06	25	D001D002D003		IS	4.3E+01	1
G DOW CORNING	MIDLAND	MI	1.8E-01		D001D003F002		OL	3.3E+02	13
T DSM CHEMICALS	AUGUSTA	GA	5.5E-07	17	U019		AL	9.0E+02	17
G DUPONT	BEAUMONT	TX	5.5E-02	23	D001		OL	1.3E+01	1
G DUPONT	BEAUMONT	TX	5.5E-02		U169		OL	1.4E+02	1
G DUPONT	BEAUMONT	TX	7.5E-04		K104		AL	1.6E+05	26
G DUPONT	BEAUMONT	TX	5.5E-02		D001		OL	5.5E+02	13
G DUPONT	LUGOFF	SC	5.5E-03		D001		OL	1.4E+01	1
G DUPONT	GIBBSTOWN	NJ	5.5E-05		K104		AL	1.7E+03	22
G DUPONT	GIBBSTOWN	NJ	5.5E-03		U169		AL	1.0E+02	13
T DUPONT	DEEPWATER	NJ	1.8E-05	43	K035		AS	4.0E+03	22
T DUPONT	DEEPWATER	NJ	5.5E-07	11	K050K051		OS	6.2E+04	27
T DUPONT	DEEPWATER	NJ	7.0E-05	12	K051		OS	5.6E+03	27
T DUPONT	DEEPWATER	NJ	5.5E-05	14	K104		AL	2.9E+03	26
G EASTMAN KODAK	ROCHESTER	NY	1.8E-01		F002F003D001		OL	6.3E+00	4
G GAF CORP.	CALVERT CITY	KY	5.5E-03		D001		OL	1.4E+03	17
G GENERAL ELECTRIC	WATERFORD	NY	5.5E-02		D001F002F003		OL	2.5E+03	17
G GENERAL ELECTRIC	WATERFORD	NY	1.8E-01		D001F002F003		OL	3.5E+03	17
G GENERAL ELECTRIC	WATERFORD	NY	7.5E-04		D001F002F003		OS	2.5E+03	4
G GENERAL ELECTRIC	WATERFORD	NY	5.5E-05		XWWS		IS	9.2E+03	10
G GENERAL ELECTRIC	WATERFORD	NY	5.5E-06		XLEA		AL	3.8E+03	26

TABLE B-4. TSDF AND GENERATORS SURVEY DATA FOR CHEMICAL PLANTS

(a) FACILITY	CITY	ST	BENZENE CONCENTRATION wt. fraction	(b) RCRA CODES	WASTE FORM (c)	WASTE QUANTITY (Mg/yr)(d)	PROCESS CODE (e)
G GEORGIA GULF CORP.	PASADENA	TX	5.5E-02	D002D003	AL	1.9E+02	13
G GLIDDEN COATINGS	CARROLLTON	TX	5.5E-03	D001F003F005	OL	1.5E+02	1
G GOODYEAR TIRE	BEAUMONT	TX	7.5E-04	31 D001U044U220	OL	1.5E+00	26
T GOODYEAR TIRE	BEAUMONT	TX	5.5E-07	17 U019	AL	1.8E+00	26
G HEAT ENERGY TECH.	DALLAS	TX	5.5E-02	36 F001F002	OL	2.5E+02	17
G HEAT ENERGY TECH.	DALLAS	TX	5.5E-02	36 F001F002F003	OL	2.7E+03	17
G HERCULES	MAGNA	UT	5.5E-02	D001F002F005	OL	9.1E-01	1
G HERCULES	GIBBSTOWN	NJ	5.5E-08	XWWS	OL	1.1E+03	5
G HERCULES	GIBBSTOWN	NJ	5.5E-07	U019	OL	2.9E+05	5
G INT'L FLAVORS & FRAGR	UNION BEACH	NJ	5.5E-06	F003	AL	3.1E+05	26
T KOPPERS	HOUSTON	TX	1.8E-05	43 K035	AS	1.1E+03	22
G LILLY COATINGS	MONTEBELLO	CA	5.5E-02	F003F005	OL	6.5E+01	1
G LILLY COATINGS	MONTEBELLO	CA	5.5E-02	F003F005	OL	2.0E+02	1
G LILLY IND. COATINGS	DALLAS	TX	5.5E-03	D001F003F005	OL	2.1E+01	1
T MALLINCKRODT CHEM.	RALEIGH	NC	3.5E-02	45 K083	OL	1.2E+03	8
T MARISOL INC.	MIDDLESEX	NJ	5.5E-07	17 U019	AL	1.4E+04	8
T MARISOL INC.	MIDDLESEX	NJ	5.5E-07	17 U019	AL	3.8E+00	8
G MEAD JOHNSON	EVANSVILLE	IN	5.5E-02	F003D001	OL	4.8E+00	1
G MINE SAFETY APPL.	EVANS CITY	PA	5.5E-05	D001	OL	4.5E-01	1
G MOBAY CORP.	HALEDON	NJ	5.0E-08	D001	AL	1.2E+06	26
G MOBIL CHEMICALS	BEAUMONT	TX	5.5E-02	D001F005	OS	6.5E+02	13
G MOBIL CHEMICALS	BEAUMONT	TX	5.5E-02	D001D001F001	OLAL	1.8E+00	1
G NORCHEM CO.	CLINTON	IA	5.5E-03	D001	OLAL	1.2E+03	13
G NORCHEM CO.	CLINTON	IA	5.5E-02	D001	OL	2.9E+00	1
G NORCHEM, INC.	MORRIS	IL	3.0E-04	D001	OL	9.1E-01	13
G OLIN CHEMICALS	AUGUSTA	GA	1.8E-01	F003F005	OL	4.5E+00	1
G OLIN CORP.	ST. MARKS	FL	5.5E-02	D003	OL	1.8E+01	17
G OLIN CORP.	ST. MARKS	FL	5.5E-06	34 D003	OS	5.1E+02	17
G OLIN CORP.	ST. MARKS	FL	6.3E-01	D003	OL	2.6E+02	17
G ORTHO DIAGNOSTICS	RARITAN	NJ	5.5E-05	F003	OL	9.1E-01	17
G PARKE-DAVIS	HOLLAND	MI	5.5E-03	D002	AL	1.3E+04	26
G PARKE-DAVIS	HOLLAND	MI	5.5E-02	F003F005	OL	1.6E+03	13
G PPG INDUSTRIES	DELAWARE	OH	5.5E-07	F003F005	OL	3.3E+02	13
G PPG INDUSTRIES	MORTON	OH	5.5E-03	D001D012D016	OL	1.1E+01	1
G REICHHOLD CHEMICALS	GULFPORT	MS	5.5E-02	D001	OL	1.5E+03	17
G SOUTHLAND CORP.	GREAT MEADOWS	NJ	5.5E-02	F001D001	OL	6.9E+01	13
G SOUTHLAND CORP.	GREAT MEADOWS	NJ	5.5E-02	D002	AL	3.2E+02	22
G SOUTHLAND CORP.	GREAT MEADOWS	NJ	8.3E-01	D001F002	OL	6.6E+01	13
T STAUFFER CHEMICAL	BATON ROUGE	LA	3.5E-02	45 K083	OL	3.4E+02	8
T STAUFFER CHEMICAL	BATON ROUGE	LA	3.5E-02	45 K083	OL	1.4E+03	8
G STEPAN CO.	ELWOOD	IL	5.0E-08	F003	OL	1.6E+01	1
G TREMCO INC.	BARBOURVILLE	KY	5.5E-06	D001	OL	5.1E+01	1
G UNION CARBIDE	SEADRIFT	TX	5.5E-02	D001	OL	6.5E+01	17
G UNION CARBIDE	SEADRIFT	TX	8.3E-01	D001	OL	1.2E+00	13
G UNION CARBIDE	SEADRIFT	TX	5.5E-03	D001	OS	9.1E-01	2
G UNION CARBIDE	SEADRIFT	TX	8.3E-01	D001	OL	0.0E+00	17
T UNION CARBIDE	PENUELAS	PR	5.5E-07	17 U019	AL	1.0E+05	15
G US ARMY MUNITIONS	KINGSTON	TN	9.5E-01	P001U019	OL	4.5E-01	1
G US INDUSTRIAL CHEM.	TUSCOLA	IL	7.5E-04	D001	OL	3.2E+02	17
G US INDUSTRIAL CHEM.	TUSCOLA	IL	7.5E-04	D001	OL	1.1E+03	17
G USS CHEMICALS	FLORENCE	KY	1.8E-01	D009F003F005	OL	1.1E-01	1
G VISTA CHEMICAL	WESTLAKE	LA	5.5E-05	D002	AL	1.9E+03	13
G VISTA CHEMICAL	WESTLAKE	LA	5.5E-07	D002	AL	8.0E+04	26
G VISTA CHEMICAL	BALTIMORE	MD	3.0E-04	D002	AL	1.5E+04	26
G VISTA CHEMICAL	BALTIMORE	MD	5.5E-07	D002	AL	1.5E+04	26
G VISTA CHEMICAL	BALTIMORE	MD	5.5E-06	D002	AL	9.5E+04	26
G VISTA CHEMICAL	BALTIMORE	MD	5.5E-02	D001	IS	7.5E+03	8
G VISTA CHEMICAL	BALTIMORE	MD	5.5E-02	D001	IS	1.6E+01	1
G VISTA CHEMICAL	BALTIMORE	MD	5.5E-02	D002	OS	5.5E+00	26
G VISTA CHEMICAL	BALTIMORE	MD	5.5E-05	D002	AL	4.8E+02	13
G VISTA CHEMICAL	BALTIMORE	MD	5.5E-02	D001	OL	1.8E+01	13

TABLE B-4. TSDF AND GENERATORS SURVEY DATA FOR CHEMICAL PLANTS

(a) FACILITY	CITY	ST	BENZENE CONCENTRATION		(b)	RCRA CODES	WASTE FORM (c)	WASTE QUANTITY (Mg/yr)(d)	PROCESS CODE (e)
			wt. fraction						
G VULCAN MATERIALS	WICHITA	KS	5.5E-05		K016		AL	4.1E+05	13
G WITCO CORP.	OILDALE	CA	9.0E-04	47	U052D007K050		AL	2.0E+05	26

(a) G = FROM GENERATOR SURVEY
T = FROM TSDR SURVEY

(b) CONCENTRATIONS ARE FROM GENERATORS SURVEY. WHEN A NUMBER (CODE) FOLLOWS, AN AVERAGE CONCENTRATION WAS ESTIMATED AND THE CODE IS KEYED TO TABLE B-5.

(c) WASTE FORMS — AL = AQUEOUS LIQUID
AS = AQUEOUS SLUDGE
OL = ORGANIC LIQUID
OS = ORGANIC SLUDGE
IS = INORGANIC SLUDGE

(d) QUANTITY OF WASTE THAT CONTAINS BENZENE.

(e) CODE FOR PROCESSING UNITS, KEYED TO TABLE B-1.

TABLE B-5. AVERAGE BENZENE CONCENTRATION VALUES DERIVED FROM GENERATOR SURVEY

CONCENTRATION CODE	RCRA WASTE CODE(S)	WASTE FORM (1)	FIRST SIC CODE	SECOND SIC CODE	BENZENE CONCENTRATION (wt. fraction)	BENZENE WASTE QUANTITY (ton/yr)	AVERAGE (2) BENZENE CONCENTRATION (wt. fraction)
2	K050	OS	2911		5.5E-05	4.0E+00	
2	K050	OS	2911		5.5E-05	4.0E+00	5.5E-05
3	K048	OS	2911		5.5E-05	1.7E+03	
3	K048	OS	2911		5.5E-06	9.5E+03	
3	K048	OS	2911		5.5E-06	9.0E+02	
3	K048	OS	2911		5.0E-08	2.4E+04	
3	K048	OS	2911		5.5E-05	4.0E+00	
3	K048	OS	2911		5.5E-05	1.6E+02	4.4E-06
4	K048K049	AL	2911		1.0E-09	1.8E+03	
4	K048K049	AL	2911		5.5E-03	1.0E+03	2.0E-03
5	K048K050K051	OS	2911	1321	5.5E-05	1.8E+04	5.5E-05
6	K048K050K051	OS	2911	1321	5.5E-05	1.8E+04	
6	K048K049K051	IS	2911		5.5E-06	1.8E+04	3.0E-05
7	K049	OS	2911		3.0E-04	2.2E+03	
7	K049	OS	2911		5.5E-03	1.1E+03	
7	K049	OS	2911		5.5E-05	2.1E+03	
7	K049	OS	2911		5.5E-06	1.7E+02	1.2E-03
8	K049	OS	2911		5.5E-05	2.1E+03	
8	K049	OS	2911		3.0E-04	2.2E+03	
8	K049	OS	2911		5.5E-03	1.1E+03	
8	K050	OS	2911		5.5E-05	4.0E+00	
8	K050	OS	2911		5.5E-05	4.0E+00	
8	K049	OS	2911		5.5E-06	1.7E+02	1.2E-03
9	K049K051	OS	2911		5.5E-07	6.5E+02	
9	K049K051	OS	2911		5.5E-03	8.3E+01	6.3E-04
10	K050	IS	2911		7.5E-04	1.3E+01	7.5E-04
11	K050K051	OS	2911		5.5E-07	6.9E+02	5.5E-07
12	K051	OS	2911	2869	5.5E-05	1.3E+03	
12	K051	OS	2911		3.0E-04	2.9E+02	
12	K051	OS	2911		5.5E-07	1.5E+02	
12	K051	OS	2911		3.0E-04	2.9E+02	
12	K051	OS	2911		3.0E-04	2.4E+02	
12	K051	OS	2911		3.0E-04	2.2E+02	
12	K051	OS	2911		5.5E-06	4.0E+02	
12	K051	OS	2911		5.5E-05	3.4E+02	
12	K051	OS	5171		5.5E-05	1.2E+00	
12	K051	OS	2911		5.5E-05	9.0E+00	
12	K051	OS	2911		5.5E-06	1.8E+03	
12	K051	OS	2911		5.5E-05	7.0E+02	
12	K051	OS	2911		5.5E-05	1.8E+03	
12	K051	OS	2911		5.5E-05	2.3E+03	7.0E-05
13	K104	AL	2865		7.5E-04	1.8E+05	7.5E-04
14	K104	AL	2869		5.5E-05	1.9E+03	5.5E-05
15	K104	AL	2865		7.5E-04	1.8E+05	
15	K104	AL	2869		5.5E-05	1.9E+03	7.7E-04
16	U019	AL	8999		5.0E-08	7.6E+03	5.0E-08
17	U019	AL	2869		5.5E-07	3.1E+05	5.5E-07
18	U019	OL	8221	8062	9.5E-01	1.0E+00	
18	U019	OL	7391		5.5E-02	1.0E+00	
18	U019	OL	4784		8.3E-01	4.2E+00	
18	U019	OL	2892		9.5E-01	5.0E-01	
18	U019	OL	2865		1.8E-01	1.4E+00	6.4E-01

TABLE B-5. AVERAGE BENZENE CONCENTRATION VALUES DERIVED FROM GENERATOR SURVEY

CONCENTRATION CODE	RCRA WASTE CODE(S)	WASTE FORM (1)	FIRST SIC CODE	SECOND SIC CODE	BENZENE CONCENTRATION (wt. fraction)	BENZENE WASTE QUANTITY (ton/yr)	AVERAGE (2) BENZENE CONCENTRATION (wt. fraction)
19	D001	IS	2865		5.5E-02	8.3E+03	
19	D001	IS	2865		5.5E-02	1.8E+01	
19	D001	IS	3721		5.5E-06	3.0E+00	
19	D001	IS	2869	2865	5.5E-06	1.3E+01	5.5E-02
20	D001	OL	2911	2800	5.5E-02	4.6E+04	
20	D001	OL	2911	2800	5.5E-02	6.9E+04	5.5E-02
21	D001	OL	2821		5.5E-02	2.8E+03	
21	D001	OL	2821	2869	3.0E-04	1.0E+00	
21	D001	OL	2821	2822	7.5E-04	2.7E+02	
21	D001	OL	2821		1.8E-01	3.8E+03	
21	D001	OL	2821		7.5E-04	1.4E+02	
21	D001	OL	2821		5.5E-02	1.6E+03	
21	D001	OL	2821	2869	5.5E-02	3.2E+00	
21	D001	OL	2821		5.5E-02	1.6E+03	1.0E-01
22	D001	OS	2911		3.0E-04	2.2E+02	
22	D001	OS	2911		5.5E-02	6.6E+01	1.3E-02
23	D001	OL	2865		5.5E-02	2.0E+01	
23	D001	OL	2865		5.5E-02	6.0E+02	5.5E-02
24	D001	OLAL	2869		5.5E-02	2.0E+00	5.5E-02
25	D001	IS	2869	2865	5.5E-06	1.3E+01	5.5E-06
26	D001	OLAL	4613	4463	5.0E-08	5.9E+06	
26	D001	OLAL	4613		5.5E-05	2.5E+02	
26	D001	OLAL	4613		5.5E-05	1.2E+03	6.4E-08
27	D001	OL	Weighted average of Nos. 21,23,30				5.7E-02
28	D001	OLAL	2821	2869	5.5E-03	1.3E+03	
28	D001	OLAL	4214	1799	5.5E-06	5.5E+03	
28	D001	OLAL	2869		5.5E-02	2.0E+00	
28	D001	OLAL	4613		5.5E-05	2.5E+02	
28	D001	OLAL	4613	4463	5.0E-08	5.9E+06	
28	D001	OLAL	4613		5.5E-05	1.2E+03	
28	D001	OLAL	2800	2869	5.5E-02	2.2E+01	1.5E-06
29	D001	OS	2869		5.5E-03	1.0E+00	
29	D001	OS	2869	2865	5.5E-06	3.6E+01	
29	D001	OS	2869	2865	5.5E-06	9.8E+02	
29	D001	OS	2869	2865	5.5E-06	4.5E+01	
29	D001	OS	2869		5.5E-06	3.1E+03	
29	D001	OS	2869		3.8E-01	4.4E+01	
29	D001	OS	2869		5.5E-02	7.2E+02	
29	D001	OS	2869	2865	5.5E-06	1.3E+03	
29	D001	OS	2869		5.5E-06	2.1E+01	9.2E-03
30	D001	OL	2869		8.3E-01	0.0E+00	
30	D001	OL	2869		8.3E-01	7.3E+01	
30	D001	OL	2869	2833	5.5E-03	1.5E+03	
30	D001	OL	2869		8.3E-01	1.3E+00	
30	D001	OL	2869		5.5E-02	6.3E+01	
30	D001	OL	2869		1.8E-01	3.7E+02	
30	D001	OL	2869	2865	5.5E-06	3.2E+01	
30	D001	OL	2869		1.8E-01	2.4E+03	
30	D001	OL	2869		1.8E-01	6.4E+01	
30	D001	OL	2869		3.0E-04	7.9E+02	
30	D001	OL	2869		5.5E-02	7.2E+01	
30	D001	OL	2869	2819	5.5E-02	2.7E+02	1.1E-01
31	D001	OL	2821	2822	7.5E-04	2.7E+02	7.5E-04

TABLE B-5. AVERAGE BENZENE CONCENTRATION VALUES DERIVED FROM GENERATOR SURVEY

CONCENTRATION CODE	RCRA WASTE CODE(S)	WASTE FORM (1)	FIRST SIC CODE	SECOND SIC CODE	BENZENE CONCENTRATION (wt. fraction)	BENZENE WASTE QUANTITY (ton/yr)	AVERAGE (2) BENZENE CONCENTRATION (wt. fraction)
32	D002	AL	2869	2865	5.5E-08	7.7E+04	
32	D002	AL	2869		5.5E-02	2.1E+02	
32	D002	AL	2865		3.0E-04	1.7E+04	
32	D002	AL	2865		5.5E-06	1.1E+05	
32	D002	AL	2869		5.5E-07	8.8E+04	
32	D002	AL	2865		5.5E-07	1.7E+04	
32	D002	AL	2869		5.5E-05	2.1E+03	
32	D002	AL	2834		5.5E-03	1.4E+04	
32	D002	AL	2865		5.5E-05	5.3E+02	
32	D002	AL	2869		5.5E-02	3.5E+02	
32	D002	AL	2869		5.5E-07	1.4E+03	
32	D002	AL	2800		5.5E-07	3.5E+02	3.5E-04
33	D002	OS	2865		5.5E-02	6.0E+00	5.5E-02
34	D003	OS	3483		5.5E-06	8.0E+00	5.5E-06
35	D008	OL	2911		1.0E-03	2.1E+00	1.0E-03
36	F001	OL	2869		5.5E-02	7.6E+01	5.5E-02
37	F003	OL	2869		5.5E-02	1.3E+01	
37	F003	OL	2869		5.5E-02	1.8E+01	5.5E-02
38	K009	OS	2869		5.5E-05	1.3E+02	5.5E-05
39	K048	AL	2911		5.5E-06	1.8E+04	
39	K048	OL	2911		5.5E-05	1.5E+04	
39	K048	OS	2911		5.5E-05	4.0E+00	
39	K048	OS	2911		5.5E-05	1.6E+02	
39	K048	OS	2911		5.5E-06	9.0E+02	
39	K048	OS	2911		5.5E-06	9.5E+03	
39	K048	OS	2911		5.0E-08	2.4E+04	
39	K048	OS	2911		5.5E-05	1.7E+03	1.5E-05
40	K051	OS	2911		5.5E-05	9.0E+00	
40	K051	OS	2911		5.5E-05	3.4E+02	
40	K051	OS	2911		3.0E-04	2.9E+02	
40	K051	OS	2911		5.5E-06	4.0E+02	
40	K051	OS	2911		5.5E-05	1.8E+03	
40	K051	OS	2911	2869	5.5E-05	1.3E+03	
40	K051	OS	2911		5.5E-05	7.0E+02	
40	K051	OS	2911		3.0E-04	2.9E+02	
40	K051	OS	2911		3.0E-04	2.4E+02	
40	K051	OS	2911		5.5E-05	2.3E+03	
40	K051	OS	2911		5.5E-07	1.5E+02	
40	K051	OS	2911		5.5E-06	1.8E+03	
40	K051	OS	2911		3.0E-04	2.2E+02	6.9E-05
41	K052	OS	2911		5.5E-03	1.0E+00	
41	K052	OS	2911		5.5E-06	1.0E+00	2.8E-03
42	K035	OL	(3)		1.1E-03	—	1.1E-03
43	K035	AL	(3)		1.8E-05	—	1.8E-05
44	K083	AL	(3)		3.9E-04	—	3.9E-04
45	K083	OL	(3)		3.5E-02	—	3.5E-02
46	K085	OL	(3)		5.0E-03	—	5.0E-03
47	U052D007K050	AL	(4)		9.0E-04	—	9.0E-04
48	D007	AL	3523		5.0E-08	9.4E+02	5.0E-08

TABLE B-5. AVERAGE BENZENE CONCENTRATION VALUES DERIVED FROM GENERATOR SURVEY

CONCENTRATION CODE	RCRA WASTE CODE(S)	WASTE FORM (1)	FIRST SIC CODE	SECOND SIC CODE	BENZENE CONCENTRATION (wt. fraction)	BENZENE WASTE QUANTITY (ton/yr)	AVERAGE (2) BENZENE CONCENTRATION (wt. fraction)
49	D007	OL	3728		7.5E-04	4.4E+01	
49	D007	OS	2911		5.5E-02	6.6E+01	
49	D007	IS	2813		3.8E-01	2.0E+00	
49	D007	OL	3471		5.5E-07	1.2E+01	3.6E-02
50	K048	AL	2911	2800	5.5E-06	1.8E+04	5.5E-06

(1) WASTE FORM:

AL = AQUEOUS LIQUID

AS = AQUEOUS SLUDGE

OL = ORGANIC LIQUID

OS = ORGANIC SLUDGE

IS = INORGANIC SOLID

(2) AVERAGE WEIGHTED BY QUANTITY.

(3) FROM REFERENCE 15.

(4) ASSUME THE CONCENTRATION IS HALF THE SOLUBILITY OF BENZENE IN WATER (1,800 ppm).

APPENDIX C: ESTIMATES OF FRACTION OF BENZENE EMITTED

C.1: ESTIMATES OF FRACTION OF BENZENE EMITTED

The estimates of the fraction of benzene emitted from wastewater collection and treatment units were obtained from Reference 11. This document describes in detail the emission models that were used and provides sample calculations. Estimates are presented for toluene, a compound with a volatility very similar to that of benzene, for three different model wastewater treatment units. Table C-1 provides the fractions emitted for individual sources in the wastewater treatment system. Three model units were developed to represent a range of complexity (in the number and types of wastewater treatment units), and the cumulative fraction emitted for these model units were estimated. The results for the collection system and for the entire treatment system are summarized in Table C-2.

Estimates of fractions emitted for other types of sources that process wastes were taken from a range of values presented in "Hazardous Waste TSDF - Background Information for Proposed RCRA Air Emission Standards (Draft)" (referred to as "TSDF BID").¹⁵ This document provides emission estimates based on model units and air emission models, developed by the Office of Air Quality Planning and Standards and published in a report entitled "Hazardous Waste Treatment, Storage, and Disposal Facilities - Air Emission Models."¹⁶

These emission factors are average values derived from a range of values for specific units. Depending on the unit's design and operation, the emission factor for a specific process at a given facility may be higher or lower. The emission factors are based on model units and mathematical models that were derived from mass transfer theory, laboratory measurements, and field evaluations. A detailed description of the models and comparisons of the model predictions to field measurements are given in the air emission models document.¹⁶ The model units used in the emission models were derived from statistical summaries of design and operating parameters of units typically found at hazardous waste facilities. For a given type of process, the emission estimates for the different model units were combined to develop an average estimate. The average estimate used in this analysis was taken from the midrange or average value from a group of model units representative of a single type of source.

TABLE C-1. FRACTIONS EMITTED FOR COMPONENTS OF A WASTEWATER SYSTEM¹¹

Component	Fraction Emitted
Drain	0.061
Manhole	0.0082
Junction box	0.098
Lift station	0.29
Sump	0.005
Open trench	0.045
Equalization basin	
(Non-aerated)	0.40
(Aerated)	0.99
Clarifier	0.025
Biobasin	
(Aerated)	0.12
(Non-aerated)	0.06
Treatment tank	0.0092
Oil-water separator	0.47
Weir	0.25

TABLE C-2. CUMULATIVE FRACTION EMITTED FOR THE MODEL UNIT¹¹

Model Unit ^a	Cumulative Fraction Emitted	
	Wastewater _b Collection	Entire Wastewater System ^c
Schematic I	0.38	0.47
Schematic II	0.21	0.74
Schematic III	0.44	1.0 ^d

^aThe 3 model units represent wastewater treatment systems that span a range of complexity and a number of units. The components in each schematic are listed below:

Schematic I

- Drains
- Lift station
- Clarifier
- Aeration basin
- Clarifier

Schematic II

- Drains
- Junction box
- Manhole
- Oil-water separator
- Nonaerated equalization basin
- pH tank
- Aeration basin
- Clarifier

Schematic III

- Drains
- Open trench
- Sump
- Junction box
- Lift station
- Aerated equalization basin
- pH tank
- Weir
- Aeration basin
- Flocculation tank
- Clarifier

^bIncludes drains, junction boxes, manholes, lift stations, etc. prior to the equalization basin or clarifier.

^cIncludes all units from the process drain to the final treatment unit.

^dEssentially all of the volatile compounds (e.g., toluene) is estimated to be emitted because this model unit includes an aerated equalization basin.

Separate factors were derived for benzene dissolved in other organics and for benzene dissolved in water to reflect the effect on the volatility of benzene. Because of benzene's low solubility in water and high vapor pressure, benzene is highly volatile in wastewater or aqueous wastes. However, when benzene is dissolved in a mixture of similar organic compounds, it exhibits a lower volatility than in aqueous wastes (when compared at the same concentration). This distinction is not important for wastes processed in open area sources with a relatively long retention time because a high percentage of the benzene will volatilize, whether it is in an organic waste or wastewater.

The process information from the data sources indicated that the wastes are usually managed in a series of individual units. For example, a typical series could include a storage unit, treatment unit, and final disposal. The percents emitted for the individual units were combined to reflect an overall percent emitted for each sequence of units. For example, a processing sequence composed of two individual units, both with a percent emitted of 50, would yield an overall percent emitted of 75, indicating that 75 percent of the total benzene in the waste would be emitted. The results for the processing sequences are summarized in Table B-1 and additional details for individual emission sources are given below.

Containers

Emissions from containers include loading emissions and spills when the container is filled, and if the container is left uncovered, evaporative losses from the open surface. Drums are common containers used for liquids, sludges, and solids. Sludges and solids may also be accumulated and stored in dumpsters or bins prior to transport or disposal. For container loading and storage, a percent emitted of 0.14 was estimated for highly volatile compounds such as benzene.¹⁵ This factor includes emissions from container loading (vapor displacement while the container is being filled) and spills (0.0001), and does not include emissions from open containers during storage. This analysis assumes that containers with benzene-containing wastes are generally kept covered to minimize emissions as part of routine operating practices for handling volatile materials.

Fixation (solidification)

Fixation or solidification involves the addition of a fixative agent to a fluid waste to produce a solid material prior to land disposal. The analysis assumes that waste fixation occurs in open sources such as drums, pug mills, or pits with agitation or mixing in the unit. The TSDF BID estimates that approximately 68 percent of the highly volatile compounds such as benzene are emitted during the solidification process.

Impoundments

Impoundments are used for storage, treatment, and disposal of liquid wastes and sludges. Some impoundments have a quiescent surface and others may have turbulent surfaces with emissions increased because of aeration or mechanical agitation. They may be operated as flow through systems (such as a storage or treatment impoundment) or as a disposal unit with only flow in (e.g., an evaporation pond). A range of emission factors was provided in the TSDF BID for highly volatile compounds in the different types of impoundments with values for percent emitted of 75 percent for impoundments used for storage, 52 percent for treatment, 71 percent for aerated units, and 100 percent for disposal units. The estimates for aerated treatment impoundments reflects that biodegradation occurs. For the other impoundments, the only removal mechanisms for benzene considered in the model is loss by air emissions or removal with the effluent from the impoundment. For this analysis, a midrange value of 76 percent emitted (52 to 100 percent) was used for the general category of impoundments because data were not available to differentiate among the different types of impoundments used for benzene waste operations. For comparison, Commenter IV-D-48 stated that emission and biodegradation models developed by their organization predicted that 72.7 percent of the benzene would be air stripped from a mechanically aerated impoundment that is biologically active. The value used in this analysis (76 percent emitted) is an approximate midrange value. For any given impoundment, actual emissions may be higher or lower depending on residence time, extent of aeration, biodegradation, surface area, and other site-specific factors.

Land Treatment

Land treatment is a land disposal process that involves spreading the waste over the ground's surface or injecting/mixing the waste below the surface. For surface application, the TSDF BID estimates that essentially all (100 percent) of the highly volatile compounds such as benzene will be emitted. For subsurface injection, biodegradation is included as a removal mechanism and approximately 85 percent of the benzene is estimated to be emitted. For this analysis, a midrange value of 93 percent (85 to 100 percent) was used for this source.

Landfills

Landfills are land disposal units that are generally divided into cells, which are filled separately, then covered and closed before starting a new cell. The TSDF BID estimates that the percent emitted for volatile compounds such as benzene ranges from 0.9 percent for covered and closed landfill cells to 22 percent for active landfill cells with a midrange value of 11 percent. This analysis assumes that currently these wastes are solidified prior to placement in a landfill. Consequently, an estimate of 72 percent emitted was derived for wastes containing benzene that are landfilled based on the loss of 68 percent during solidification and the loss of 11 percent of the balance in the landfill.

$$\text{Fraction emitted} = 0.68 + (0.11) \times (0.32) = 0.72$$

Incineration

For waste incineration, a value of 0.01 percent emitted from the TSDF BID was used. This is based on a required destruction and removal efficiency of 99.99 percent of the principal organic hazardous constituents during hazardous waste incineration.

Tanks

The waste management unit for some waste streams was identified as storage or treatment in tanks. An estimate of emissions was derived for benzene wastes in tanks that is separate from the more extensive treatment common in wastewater treatment tanks. The approach for covered tanks assumes that emissions occur primarily from working losses (displacement of vapor from the tank when waste is pumped in) and that the vapor displacement rate is

equal to the waste pumping rate. The equations for tank emissions given in the air emission model report for working (loading) losses were used.¹⁶ For benzene in organic wastes, the tanks are assumed to be covered with a residence time that is typically 10 days or more (the turnover factor in the tank equation equals 1). The vapor phase concentration of benzene in the tank's headspace was estimated using Raoult's law, a pure component vapor pressure of 95 mm Hg for benzene, an average molecular weight of 100 for the waste, and a waste density of 0.8 g/cm³ (for an organic liquid). The resulting estimate for benzene dissolved in similar organics when loaded into a covered tank is 0.065 percent emitted.

Aqueous wastes containing benzene were assumed to be handled in both open and covered tanks. For open tanks with a residence time of a few hours, the TSDF BID estimates that approximately 11 percent of highly volatile compound such as benzene would be emitted. For covered tanks, the tank equations in the emission model report¹⁶ were used and resulted in a range of 3.2 percent (for a residence time of 3 hours with the turnover factor equal to 0.18) to 18 percent (for a residence time greater than 10 days and the turnover factor equal to 1). The midrange value is 11 percent emitted, which was used for benzene in aqueous wastes placed in covered tanks (with a range of residence times) and open tanks (with residence times of a few hours). For special cases in which the tank is aerated or the waste stays in an open tank for days, the percent emitted would be higher than 11 percent.

The large difference in the percent emitted for benzene in aqueous wastes compared to organic wastes results from the estimated vapor phase concentration of benzene in the tank's headspace. For a given benzene concentration in the waste, Raoult's law yields much lower vapor phase concentrations than those obtained by Henry's law. For aqueous waste containing benzene at about 1,800 ppm (solubility of benzene in water), the vapor phase concentration above the aqueous waste is estimated to be the same as if pure benzene were in the tank.

Truck loading

Emissions occur from the displacement of vapors during truck loading and from spills. The TSDF BID provides an estimate of 0.13 percent emitted for organic liquids and 0.14 percent for aqueous liquids that contain highly volatile compounds such as benzene.

Waste Piles

The TSDF BID estimates that 1.25 percent of highly volatile compounds such as benzene is emitted from solidified waste that is accumulated, stored, or disposed of in waste piles. An inherent assumption is that the waste is solidified prior to placement in a waste pile. For this analysis, the sequence of solidification and placement in a waste pile yields an estimate of 68 percent emitted.¹⁵

$$\text{Fraction emitted} = 0.68 + (0.0125) \times (0.32) = 0.68$$

Filtration/Dewatering

Filtration/dewatering processes are designed to remove solids, usually as a sludge, and to produce a liquid waste with low solids content. For the dewatering of aqueous wastes, the data base did not provide information on the amount of sludge and wastewater produced. For this analysis, 20 percent of the waste was assumed to be sludge and 80 percent water. The overall fraction emitted for dewatering aqueous wastes was estimated from:

	<u>fe</u>
dewatering device (treat as a tank)	0.11
sludge (containers)	$(1-0.11)(0.2)(0.0014) = 0.00025$
water layer (wastewater treatment)	$(1-0.11)(0.8)(0.73) = 0.52$
Total	$= 0.63$

Similar assumptions were required for filtration or solids removal from organic wastes. For this case, the waste was assumed to be 20 percent sludge and 80 percent organic liquid, both of which are loaded into containers. The overall fraction emitted is estimated from:

	<u>fe</u>
filtration (tank)	0.00065
sludge (containers)	$(0.2)0.0014 = 0.00028$
organic liquid (containers)	$(0.8)0.0014 = 0.00112$
Total	$= 0.0021$

Estimates for Processing Sequences

Example calculations for the processing sequences used in this analysis are given in Table C-3 and the results are summarized in Table B-1.

TABLE C-3. CALCULATIONS FOR PROCESSING SEQUENCES*

2. Containers, landfill

$$fe = 0.0014 + (1-0.0014) (0.72) = 0.72$$

3. Containers, tanks

$$\text{organic: } fe = 0.0014 + (1-0.0014) (0.00065) = 0.002$$

$$\text{aqueous: } fe = 0.0014 + (1-0.0014) (0.11) = 0.11$$

4. Containers, incineration

$$fe = 0.0014 + (-0.0014) (0.0001) = 0.0015$$

7. Impoundment, wastewater treatment

$$fe = 0.76 = (1-0.76) (0.73) = 0.94$$

14. Tanks, dewater

$$\text{organic: } fe = 0.00065 + (1-0.00065) (0.002) = 0.003$$

$$\text{aqueous: } fe = 0.11 + (1-0.11) (0.63) = 0.67$$

15. Tanks, impoundment, wastewater treatment

$$\text{organic: } fe = 0.76 = (1-0.76) (0.73) = 0.94$$

$$\text{aqueous: } fe = 0.79 + (1-0.79) (0.73) = 0.94$$

16. Tanks, impoundment, solidification, land treatment, landfill

Assume that the waste is 80 percent water (to wastewater treatment) and 20 percent sludge. Assume 10 percent is solidified and landfilled and 10 percent is land treated.

	<u>fe</u>
Tanks	0.11
Impoundment	$(1-.11) 0.76 = 0.68$
Water (wastewater treatment)	$0.8 (1-0.79) 0.73 = 0.12$
Solidify, landfill	$0.1 (1-0.79) 0.72 = 0.01$
Land treatment	$0.1 (1-0.79) 0.93 = 0.02$
	TOTAL = 0.94

17. Tanks, incineration

$$\text{organic: } fe = 0.00065 + (1-0.00065) 0.0001 = 0.00075$$

$$\text{aqueous: } fe = 0.11 + (1-0.11) 0.0001 = 0.11$$

TABLE C-3. (cont'd)

18. Tanks, landfill

$$\text{organic: } fe = 0.0065 + (1-0.0065) 0.73 = 0.72$$

$$\text{aqueous: } fe = 0.11 + (1-0.11) 0.72 = 0.75$$

19. Tanks, solidification, incineration

$$\text{organic: } fe = 0.00065 + (1-0.00065) 0.68 + (1-0.001) 0.0001 = 0.68$$

$$\text{aqueous: } fe = 0.11 + (1-0.11) 0.68 + (1-0.18) 0.0001 = 0.72$$

20. Tanks, solidification, landfill

$$\text{organic: } fe = 0.00065 + (1-0.00065) 0.72 = 0.72$$

$$\text{aqueous: } fe = 0.11 + (1-0.11) 0.72 = 0.75$$

21. Tanks, solidify, wastepile

$$\text{organic: } fe = 0.00065 + (1-0.00065) 0.68 = 0.68$$

$$\text{aqueous: } fe = 0.11 + (1-0.11) 0.68 = 0.72$$

22. Tanks, wastewater treatment

$$fe = 0.11 + (1-0.11) 0.73 = 0.76$$

23. Part 1 - Tanks, wastewater treatment, impoundment

$$fe = 0.11 + (1-0.11) 0.73 + (0.73) (0.76) = 0.97$$

23. Part 2 - (Tanks, wastewater treatment, impoundment) solidification, landfill

$$fe = 0.97 + (1-0.97) 0.72 = 0.99$$

24. Tanks, wastewater treatment, incineration

Use 0.76 from above.

25. Tanks, wastewater treatment, solidification

$$fe = 0.11 + (1-0.11) 0.73 + (1-0.73) 0.68 = 0.92$$

27. Wastewater treatment, landfill

$$fe = 0.73 + (1-0.73) 0.72 = 0.92$$

*Calculations are presented for those processing sequences in Table B-1.

Controls and Efficiency

The control techniques evaluated included those that are used to treat the waste to remove or destroy benzene and other volatile organics before the wastes are placed in open or aerated sources (such as impoundments, open wastewater treatment tanks, land treatment). Applicable and generally available treatment technologies include steam stripping for wastewater, thin-film evaporation for sludges, and waste incineration or recovery of fuel value for organic liquids. Emission controls were also evaluated for other waste management operations that might be used. For example, if storage or other treatment (pH adjustment, solids settling) is needed ahead of the primary treatment device, emission sources associated with the storage or treatment would need to be controlled for benzene emissions. Controls evaluated for these processes included covers or enclosures vented to a control device.

For tanks used in benzene waste operations, typical controls include floating roofs, venting to a carbon adsorber, vapor incineration, or other onsite vapor control systems. Information presented in the TSDF BID indicate that these controls are capable of reducing emissions by at least 95 percent.¹⁵ Submerged fill, indicated in the TSDF BID to reduce emissions by 65 percent, is assumed to be used for loading containers and tank trucks, and containers are assumed to be kept covered except when waste is being added or removed.

For steam stripping and thin-film evaporation, the control efficiency was calculated as the difference between the estimated emissions of the treatment process and the emissions from the treatment sequence that it replaces or precedes. The nationwide impacts analysis was made assuming that wastewater would be steam stripped, aqueous and organic sludges would be processed in a thin-film evaporator or incinerator, and organic liquids would be burned (as hazardous waste or as fuel).

The fraction of benzene in the waste that is emitted during steam stripping is estimated to range from 0.007 to 0.014. This estimate is based on assumptions that the stripper will remove 99.5 to 99.9 percent of the benzene in the waste, and that the condenser will condense 90 to 99 percent of the benzene in the overhead vapors. A storage tank with a 95-percent control device is assumed to be placed ahead of the stripper, a 95-percent vapor control device is used on the primary condenser vent, the organic condensate

is loaded into drums, and the stripper bottoms (effluent) are assumed to go to wastewater treatment. The process is shown schematically in Figure C-1. For this configuration, the range of the fraction of benzene emitted to the air from the process is estimated using the material balance in Figure C-1 and the emission factors previously discussed.

<u>Source</u>	<u>Fraction emitted (fe)</u>
Storage tank	$0.11 \times 0.05 = 0.0055$
Effluent	$0.73 \times (0.00089 \text{ to } 0.00445) = 0.00065 \text{ to } 0.0032$
Condenser	0.00045 to 0.00445
Drum loading	$(0.0014) \times (0.35) \times (0.80 \text{ to } 0.88) = 0.00039 \text{ to } 0.00043$
TOTAL	0.007 to 0.014.

For wastewater treatment with an uncontrolled fraction emitted of 0.73, steam stripping results in an overall control efficiency of 98.1 to 99.3 percent. For the purpose of estimating nationwide impacts, an efficiency of 99 percent was used.

Similar design assumptions were required to estimate the efficiency of a thin-film evaporator. For this device, the benzene removal efficiency was assumed to be 99 percent, and the condenser was assumed to remove 90 to 99 percent of the benzene in the vapor. Other sources are assumed to be controlled as described for the steam stripper. The schematic for this process is given in Figure C-2 and the fraction emitted is estimated as follows:

<u>Source</u>	<u>Fraction emitted (fe)</u>
Storage tank	$0.11 \times 0.05 = 0.0055$
Bottoms	$(0.0089) \times 0.93 = 0.0083$ (assumes land treated)
Condenser	0.0044 to 0.00044
Drum loading	0.00039 to 0.00043
TOTAL	0.015 to 0.019

For land treatment and landfiling, which have estimated uncontrolled fractions emitted of 0.93 and 0.72, respectively, the calculated control efficiency was 98.0 to 98.4 and 97.4 to 97.9 percent, respectively. In the estimates of nationwide impacts, an average control efficiency of 98 percent was used.

Waste incineration is expected to achieve a destruction and removal efficiency of at least 99 percent, and many incinerators are required to achieve 99.99 percent. For this analysis, the fraction emitted for waste incineration is estimated at 0.0001 and is based on a destruction and removal

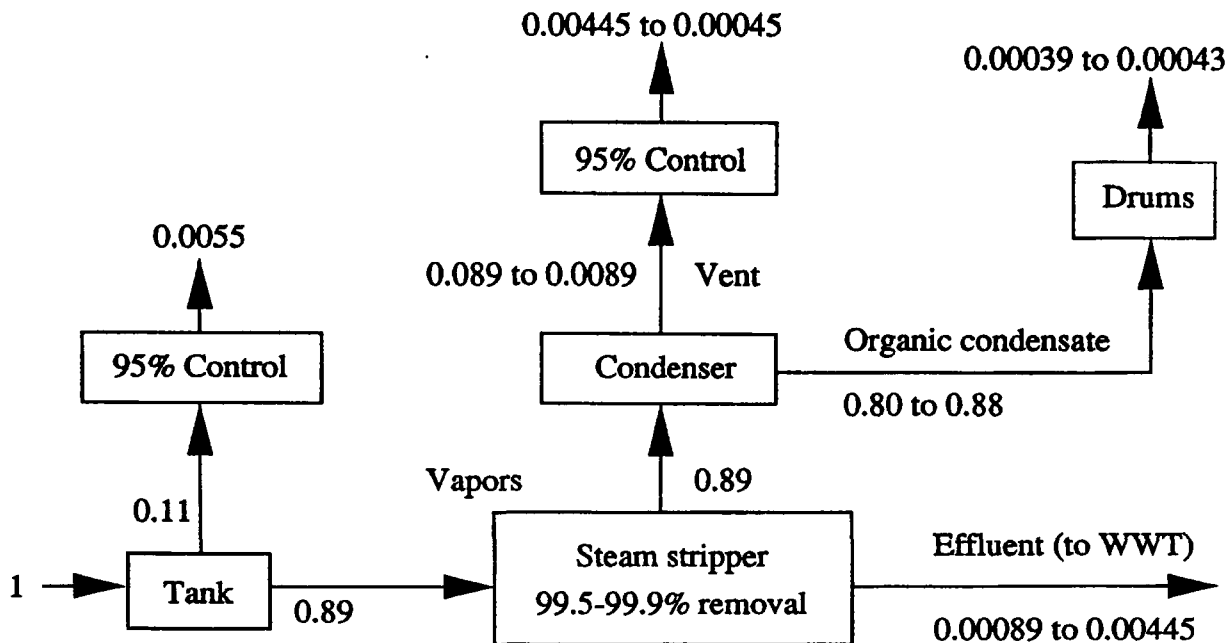


FIGURE C-1. DISTRIBUTION OF BENZENE EMISSIONS FOR A STEAM STRIPPER
(based on 1 unit of benzene in the waste)

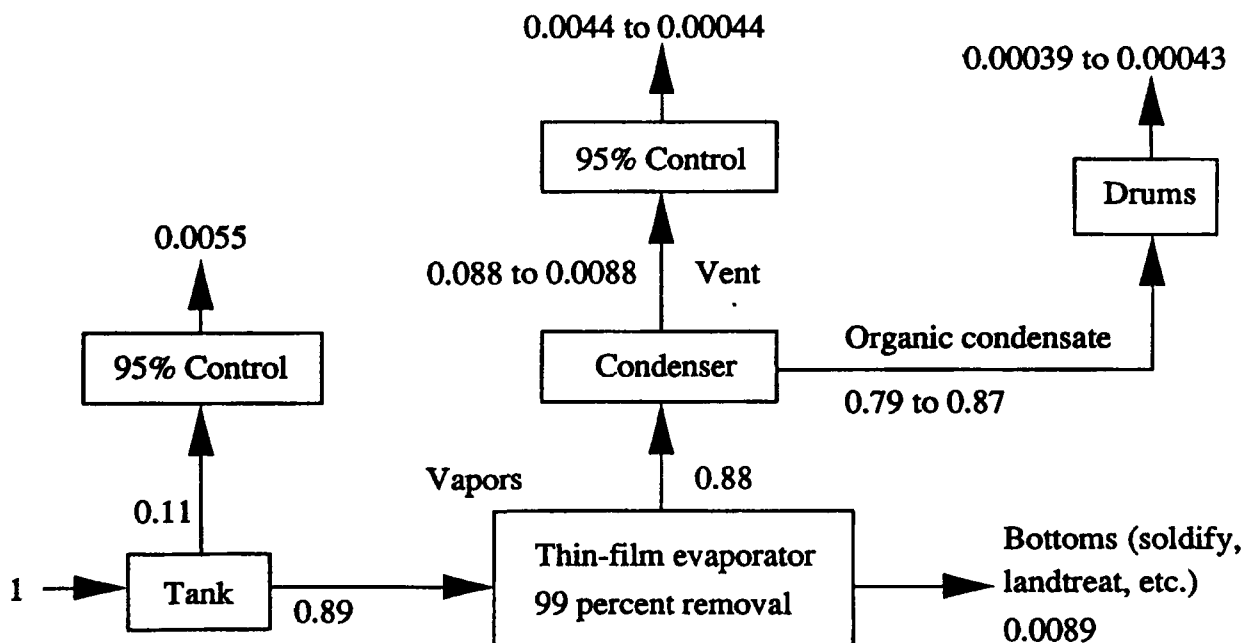


FIGURE C-2. DISTRIBUTION OF BENZENE EMISSIONS FOR A TFE (based on 1 unit
of benzene in the waste)

efficiency of 99.99 percent. (The use of a control efficiency of 99 percent yielded essentially the same impacts as 99.99 percent in terms of emissions, maximum risk, and incidence.) For wastes that are already incinerated, no additional controls are included. However, if the waste is stored in containers or tanks prior to incineration, the containers or tanks would be controlled as previously discussed.

Filtration/Dewatering

The estimate of fraction emitted for filtration/dewatering operations is based on the assumptions (previously discussed for dewatering) and the estimated uncontrolled fraction emitted of 0.80. The dewatering device is treated as a tank, submerged fill is used for containers, and water is steam stripped:

	<u>fe (controlled)</u>
Dewatering device (tank)	$0.11 \times 0.05 = 0.0055$
Sludge (containers)	$0.00025 \times 0.35 = 0.000088$
Water layer (steam strip)	$0.063 \times 0.01 = 0.0063$
	TOTAL = 0.012
	Percent control = 98.1

For the filtration of organics for solids removal, where the uncontrolled fraction emitted is 0.0021, the fraction emitted is estimated from:

	<u>fe (controlled)</u>
Filtration (tank)	$0.00065 \times 0.05 = 0.000033$
Sludge (containers)	$0.00028 \times 0.35 = 0.0001$
Organic liquids (containers)	$0.00112 \times 0.35 = 0.00039$
	TOTAL = 0.00052
	Percent control = 75

The percent control applied to other specific sources is summarized below:

<u>Control</u>	<u>Percent control</u>	<u>Types of sources</u>
Control device for vents	95	enclosed, vented sources (covered tanks)
Submerged fill	65	container and truck loading
Steam stripping (wastewater)	99	wastewater treatment tanks
Thin-film evaporation (sludges)	98	land treatment, landfilling of sludges
Waste incineration	99.99	disposal or treatment of organic liquids

TABLE A-2. ESTIMATED WASTE QUANTITIES FOR REFINERY WASTEWATERS

PLANT	CITY	ST	MINIMUM WASTE QUANTITIES (Mg/yr)*				MAXIMUM WASTE QUANTITIES (Mg/yr)*			
			1,2,12	3,4,6,7,8 9,10,11	5	13	1,2,12	3,4,6,7,8 9,10,11	5	13
AMERADA HESS	PURVIS	MS	8.3E+04	4.1E+04	1.8E+03	0.0E+00	8.4E+04	4.9E+04	1.8E+03	0.0E+00
AMERADA-HESS	PORT READING	NJ	0.0E+00	7.6E+04	0.0E+00	0.0E+00	0.0E+00	7.6E+04	0.0E+00	0.0E+00
AMOCO	SALT LAKE CITY	UT	1.1E+05	5.0E+04	2.3E+03	0.0E+00	1.1E+05	6.0E+04	2.3E+03	0.0E+00
AMOCO	CASPER	WY	1.1E+05	4.3E+04	2.1E+03	0.0E+00	1.1E+05	5.3E+04	2.1E+03	0.0E+00
AMOCO	WHITING	IN	9.7E+05	5.3E+05	2.6E+04	3.6E+04	9.7E+05	6.2E+05	2.6E+04	3.6E+04
AMOCO	SAVANNAH	GA	7.8E+04	1.6E+04	0.0E+00	0.0E+00	7.8E+04	2.2E+04	0.0E+00	0.0E+00
AMOCO	MANDAN	ND	1.6E+05	7.3E+04	3.7E+03	0.0E+00	1.6E+05	8.8E+04	3.7E+03	0.0E+00
AMOCO	TEXAS CITY	TX	1.2E+05	7.1E+05	4.9E+04	1.2E+05	1.2E+05	8.1E+05	4.9E+04	1.2E+05
AMOCO	YORKTOWN	VA	1.4E+05	1.3E+05	3.0E+03	0.0E+00	1.4E+05	1.4E+05	3.0E+03	0.0E+00
ANCHOR REF.	MCKITTRICK	CA	2.8E+04	5.5E+03	0.0E+00	0.0E+00	2.8E+04	8.0E+03	0.0E+00	0.0E+00
ARCO ALASKA	KUPARUK	AK	3.3E+04	6.6E+03	0.0E+00	0.0E+00	3.3E+04	9.6E+03	0.0E+00	0.0E+00
ARCO ALASKA	PRUDHOE BAY	AK	3.9E+04	7.8E+03	0.0E+00	0.0E+00	3.9E+04	1.1E+04	0.0E+00	0.0E+00
ARCO PETROLEUM	FERNDALE	WA	4.5E+05	3.0E+05	1.7E+04	0.0E+00	4.5E+05	3.4E+05	1.7E+04	0.0E+00
ASHLAND	ASHLAND	KY	5.9E+05	2.7E+05	1.6E+04	1.5E+04	5.9E+05	3.2E+05	1.6E+04	1.5E+04
ASHLAND	ST. PAUL PARK	MN	1.9E+05	7.2E+04	7.2E+03	0.0E+00	1.9E+05	8.9E+04	7.2E+03	0.0E+00
ASHLAND	CANTON	OH	1.8E+05	7.5E+04	6.1E+03	0.0E+00	1.8E+05	9.1E+04	6.1E+03	0.0E+00
ATLANTIC REFINING	PHILADELPHIA	PA	3.5E+05	1.1E+05	1.8E+04	0.0E+00	3.5E+05	1.4E+05	1.8E+04	0.0E+00
ATLANTIC RICHFIELD	CARSON	CA	5.9E+05	4.8E+05	1.5E+04	0.0E+00	6.0E+05	5.4E+05	1.5E+04	0.0E+00
BARRETT REF.	THOMAS	OK	3.6E+04	7.2E+03	0.0E+00	0.0E+00	3.6E+04	1.0E+04	0.0E+00	0.0E+00
BELCHER REF.	MOBILE BAY	AL	4.0E+04	7.9E+03	0.0E+00	0.0E+00	4.0E+04	1.1E+04	0.0E+00	0.0E+00
BERRY PETROLEUM	STEVENS	AK	1.1E+04	2.1E+03	0.0E+00	0.0E+00	1.1E+04	3.1E+03	0.0E+00	0.0E+00
BIG WEST OIL	SALT LAKE CITY	UT	6.7E+04	2.1E+04	1.5E+03	0.0E+00	6.7E+04	2.7E+04	1.5E+03	0.0E+00
BLOOMFIELD REFINING	BLOOMFIELD	NM	4.7E+04	1.8E+04	8.5E+02	0.0E+00	4.7E+04	2.2E+04	8.5E+02	0.0E+00
BP OIL	BELLE CHASSE	LA	5.4E+05	3.4E+05	1.1E+04	8.4E+04	5.4E+05	3.9E+05	1.1E+04	8.4E+04
BP OIL	MARCUS HOOK	PA	4.7E+05	1.7E+05	1.5E+04	0.0E+00	4.8E+05	2.1E+05	1.5E+04	0.0E+00
CALCASIEU REFINING	LAKE CHARLES	LA	3.3E+04	6.6E+03	0.0E+00	0.0E+00	3.3E+04	9.6E+03	0.0E+00	0.0E+00
CALUMET REFINING COM	PRINCETON	LA	1.1E+04	2.3E+03	0.0E+00	0.0E+00	1.1E+04	3.3E+03	0.0E+00	0.0E+00
CANAL REF.	CHURCH POINT	LA	2.7E+04	5.5E+03	5.8E+02	0.0E+00	2.8E+04	7.9E+03	5.8E+02	0.0E+00
CENEX REF.	LAUREL	MT	1.1E+05	4.1E+04	3.7E+03	0.0E+00	1.1E+05	5.1E+04	3.7E+03	0.0E+00
CHAMPLIN PETROLEUM C	CORPUS CHRISTI	TX	4.2E+05	3.3E+05	1.6E+04	1.4E+04	4.2E+05	3.7E+05	1.6E+04	1.4E+04
CHEMOIL	SIGNAL HILL	CA	4.0E+04	8.0E+03	0.0E+00	0.0E+00	4.0E+04	1.2E+04	0.0E+00	0.0E+00
CHEVRON	PASCAGOULA	MS	8.2E+05	5.1E+05	2.7E+04	1.5E+04	8.2E+05	5.9E+05	2.7E+04	1.5E+04
CHEVRON	EL SEGUNDO	CA	9.1E+05	2.7E+05	1.8E+04	4.2E+03	9.2E+05	3.6E+05	1.8E+04	4.2E+03
CHEVRON	PORTLAND	OR	4.2E+04	8.3E+03	0.0E+00	0.0E+00	4.2E+04	1.2E+04	0.0E+00	0.0E+00
CHEVRON	HONOLULU	HI	1.3E+05	6.0E+04	0.0E+00	0.0E+00	1.3E+05	7.2E+04	0.0E+00	0.0E+00
CHEVRON	PORT ARTHUR	TX	9.1E+05	5.0E+05	2.0E+04	2.8E+04	9.2E+05	5.8E+05	2.0E+04	2.8E+04
CHEVRON	KENAI	AK	6.1E+04	1.2E+04	0.0E+00	0.0E+00	6.1E+04	1.8E+04	0.0E+00	0.0E+00
CHEVRON	PERTH AMBOY	NJ	2.2E+05	4.4E+04	0.0E+00	0.0E+00	2.2E+05	6.4E+04	0.0E+00	0.0E+00
CHEVRON	SALT LAKE CITY	UT	1.2E+05	8.9E+04	1.7E+03	0.0E+00	1.3E+05	1.0E+05	1.7E+03	0.0E+00
CHEVRON	EL PASO	TX	1.8E+05	7.0E+04	7.6E+03	0.0E+00	1.8E+05	8.6E+04	7.6E+03	0.0E+00
CHEVRON	SEATTLE	WA	1.4E+04	2.8E+03	0.0E+00	0.0E+00	1.4E+04	4.0E+03	0.0E+00	0.0E+00
CHEVRON	RICHMOND	CA	7.5E+05	2.5E+05	2.1E+04	0.0E+00	7.5E+05	3.1E+05	2.1E+04	0.0E+00
CHEVRON	PHILADELPHIA	PA	4.8E+05	1.8E+05	1.0E+04	1.5E+04	4.8E+05	2.2E+05	1.0E+04	1.5E+04
CIBRO PETROLEUM	ALBANY	NY	1.2E+05	2.4E+04	0.0E+00	0.0E+00	1.2E+05	3.4E+04	0.0E+00	0.0E+00
CITGO PETROLEUM	LAKE CHARLES	LA	8.9E+05	6.8E+05	2.8E+04	0.0E+00	8.9E+05	7.6E+05	2.8E+04	0.0E+00
CLARK OIL & REFINING	BLUE ISLAND	IL	1.8E+05	7.4E+04	9.3E+03	0.0E+00	1.8E+05	9.0E+04	9.3E+03	0.0E+00
CLARK OIL & REFINING	HARTFORD	IL	1.7E+05	1.4E+05	3.7E+03	0.0E+00	1.7E+05	1.5E+05	3.7E+03	0.0E+00
COASTAL EAGLE PT.	WESTVILLE	NJ	3.0E+05	1.4E+05	1.2E+04	4.4E+04	3.0E+05	1.7E+05	1.2E+04	4.4E+04
COASTAL REFINING	CORPUS CHRISTI	TX	2.5E+05	1.3E+05	8.7E+03	5.0E+04	2.5E+05	1.6E+05	8.7E+03	5.0E+04
COLORADO REF.	COMMERCE CITY	CO	7.8E+04	2.8E+04	2.7E+03	0.0E+00	7.8E+04	3.5E+04	2.7E+03	0.0E+00
CONOCO	COMMERCE CITY	CO	1.2E+05	4.7E+04	2.3E+03	0.0E+00	1.2E+05	5.8E+04	2.3E+03	0.0E+00
CONOCO	PONCA CITY	OK	3.8E+05	2.3E+05	1.1E+04	0.0E+00	3.8E+05	2.7E+05	1.1E+04	0.0E+00
CONOCO	BILLINGS	MT	1.3E+05	5.0E+04	3.8E+03	0.0E+00	1.4E+05	6.3E+04	3.8E+03	0.0E+00
CONOCO	SANTA MARIA	CA	2.6E+04	5.3E+03	0.0E+00	0.0E+00	2.6E+04	7.6E+03	0.0E+00	0.0E+00
CONOCO	WESTLAKE	LA	4.3E+05	3.7E+05	8.3E+03	0.0E+00	4.4E+05	4.1E+05	8.3E+03	0.0E+00
CROSS OIL & REFINING	SMACKOVER	AR	1.9E+04	3.8E+03	0.0E+00	0.0E+00	1.9E+04	5.5E+03	0.0E+00	0.0E+00
CROWN CENTRAL	HOUSTON	TX	2.8E+05	1.9E+05	1.1E+04	1.1E+04	2.8E+05	2.2E+05	1.1E+04	1.1E+04
CRYSER REFINING	WOODS CROSS	UT	3.5E+04	6.9E+03	9.1E+02	0.0E+00	3.5E+04	1.0E+04	9.1E+02	0.0E+00
CRYSTAL REF.	CARSON CITY	MI	1.1E+04	2.2E+03	0.0E+00	0.0E+00	1.1E+04	3.2E+03	0.0E+00	0.0E+00
DERBY REFINING COMPA	WICHITA	KS	8.3E+04	6.9E+04	2.0E+03	0.0E+00	8.3E+04	7.7E+04	2.0E+03	0.0E+00
DERBY REF.	EL DORADO	KS	7.9E+04	3.8E+04	1.4E+03	0.0E+00	7.9E+04	4.5E+04	1.4E+03	0.0E+00
DIAMOND SHAMROCK	THREE RIVERS	TX	1.4E+05	5.7E+04	3.3E+03	0.0E+00	1.4E+05	6.9E+04	3.3E+03	0.0E+00
DIAMOND SHAMROCK	SUNRAY	TX	2.9E+05	1.3E+05	8.8E+03	0.0E+00	2.9E+05	1.5E+05	8.8E+03	0.0E+00
EDGINGTON OIL COMPAN	LONG BEACH	CA	1.2E+05	2.3E+04	0.0E+00	0.0E+00	1.2E+05	3.3E+04	0.0E+00	0.0E+00
EL PASO REFINING	EL PASO	TX	5.8E+04	3.9E+04	1.7E+03	0.0E+00	5.8E+04	4.5E+04	1.7E+03	0.0E+00
ERGON REF.	VICKSBURG	MS	4.7E+04	9.3E+03	0.0E+00	0.0E+00	4.7E+04	1.3E+04	0.0E+00	0.0E+00
EXXON	BATON ROUGE	LA	1.3E+06	8.7E+05	2.7E+04	0.0E+00	1.3E+06	9.9E+05	2.7E+04	0.0E+00

APPENDIX D: HUMAN EXPOSURE MODEL

D.1: HUMAN EXPOSURE MODEL

Input parameters were provided for risk modeling performed by EPA's Pollutant Assessment Branch using the Human Exposure Model (HEM). The key inputs to the risk analysis were: 1) the benzene emissions from each facility, 2) the emission point parameters (e.g., temperature and height of release), and 3) the location of each facility. The emission point parameters used in the risk analysis were the same for all facilities and are shown in Table D-1. Table D-2 lists each facility and the latitude and longitude used in the modeling. The major sources of information for latitude and longitude included the survey of hazardous waste treatment, storage, disposal and recycling facilities; the survey of hazardous waste generators; locations used for modeling in the NESHA for benzene equipment leaks; a data base developed by EPA's Pollutant Assessment Branch (ATERIS); and the SARA Title 3 data base.

Four modeling runs were made using the HEM. The results for Cases 1 and 2 (Tables D-3 and D-4) represent the baseline and the estimated minimum and maximum emissions, respectively. Cases 3 and 4 (Tables D-5 and D-6) represent the controlled case for the estimated minimum and maximum emissions, respectively. The population exposure estimates for each risk level are presented for the 4 cases in Tables D-7 through D-10.

The estimates presented in the following tables should not be viewed as site-specific risk estimates because site-specific emission data, meteorological conditions, source configuration, etc. were not available. The HEM analysis was performed to develop an estimate of risk for the source category. Consequently, these estimates are not detailed site-specific estimates for specific facilities. A detailed site-specific analysis could result in estimates of risk that are higher or lower than those presented here.

TABLE D-1. MODELING ASSUMPTIONS USED IN HEM ANALYSIS

Field	Assumption
Urban/Rural	Urban
Type	Horizontal
Height	3 m
Cross-sectional area	10 m ²
Diameter	0.1 m
Gas exit velocity	0.01 m/s
Gas exit temperature	298K
Gas flow rate	0.1 m/s

TABLE D-2. LOCATIONS USED IN HUMAN EXPOSURE MODEL

PLANT	CITY	STATE	LATITUDE	LONGITUDE
3-M COMPANY	COTTAGE GROVE	MN	444730	925430
ABBOTT LABORATORIES	WICHITA	KS	373423	972554
ABC COKE	TARRANT	AL	333457	864649
ACME STEEL	CHICAGO	IL	413922	873732
AIR PRODUCTS & CHEM.	WICHITA	KS	373423	972554
ALDRICH CHEMICALS	MILWAUKEE	WI	430206	870105
ALLIED CHEMICAL	IRONTON	OH	383055	823952
ALLIED SIGNAL	BIRMINGHAM	AL	332950	865452
ALPHA CHEMICAL	LAKELAND	FL	280600	820027
ALPHA RESINS	PERRIS	CA	334700	1171400
AMCHEM PRODUCTS INC.	AMBLER	PA	400900	751300
AMERADA HESS	PURVIS	MS	311120	892414
AMERADA-HESS	PORT READING	NJ	403500	741500
AMERICAN CYANAMID	BRIDGEWATER	NJ	403328	743313
AMERICAN CYANAMID CO	HANNIBAL	MO	395110	912545
AMERICAN CYANAMID CO	LINDEN	NJ	403551	741216
AMERICAN HOECHST COR	HOUSTON	TX	293610	950115
AMERICAN HOECHST COR	PASADENA	TX	293747	950413
AMOCO	CASPER	WY	425027	1062105
AMOCO	MANDAN	ND	464908	1005215
AMOCO	SAVANNAH	GA	320638	810730
AMOCO	TEXAS CITY	TX	292158	945545
AMOCO CHEMICAL	TEXAS CITY	TX	292228	945530
AMOCO CHEMICAL	WHITING	IN	413700	872900
AMOCO OIL REFINERY	SALT LAKE CITY	UT	404730	1115410
AMOCO OIL REFINERY	YORKTOWN	VA	371245	762645
ANCHOR REF.	MCKITTRICK	CA	351500	1193000
ARCO ALASKA	KUPARUK	AK	680000	1570000
ARCO ALASKA	PRUDHOE BAY	AK	680000	1570000
ARCO PETROLEUM	FERNDALE	WA	485430	1224430
ARIS TECH CHEMICAL	HAVERHILL	OH	383530	824901
ARMCO INC	MIDDLETOWN	OH	392840	842301
ARMCO INC.	ASHLAND	KY	382730	823638
ASHLAND CHEMICAL	BOYD CO.	KY	382236	823708
ASHLAND OIL	CANTON	OH	404615	812500
ASHLAND PETROLEUM	ST. PAUL PARK	MN	445053	930029
ASHLAND PETROLEUM CO	ASHLAND	KY	382230	823632
ATLANTIC REFINING	PHILADELPHIA	PA	395539	751241
ATLANTIC RICHFIELD	CARSON	CA	334835	1181420
ATLANTIC RICHFIELD	HOUSTON	TX	294245	951430
ATLANTIC RICHFIELD C	MONACA	PA	403921	801834
ATLANTIC WOOD INDUST	HAINESPORT	NJ	400545	744952
ATLANTIC WOOD INDUST	PORTSMOUTH	VA	365500	762000
ATLANTIC WOOD INDUST	SAVANNAH	GA	320000	812000
AYERST LABS	ROUSES POINT	NY	445337	732812
BARRETT REF.	THOMAS	OK	354000	994500
BASF WYANDOTTE CORP.	JAMESBURG	NJ	402300	742700
BELCHER REF.	MOBILE BAY	AL	303500	880000
BERRY PETROLEUM	STEVENS	AK	332500	930000
BETHLEHEM STEEL	BURNS HARBOR	IN	413805	870738
BETHLEHEM STEEL	LACKAWANNA	NY	424937	785133
BETHLEHEM STEEL CORP	BETHLEHEM	PA	403649	752145
BETHLEHEM STEEL CORP	SPARROWS POINT	MD	391245	762745
BF GOODRICH	AVON LAKE	OH	413010	820010
BF GOODRICH CHEMICAL	CALVERT CITY	KY	370319	881951
BIG WEST OIL	SALT LAKE CITY	UT	404730	1115410
BLOOMFIELD REFINING	BLOOMFIELD	NM	364727	1074711
BP OIL	BELLE CHASSE	LA	294108	895837
BP OIL	MARCUS HOOK	PA	394912	752526
BROWNING MANUF.	MORGAN	UT	410200	1114000
CAIN CHEMICAL	BRAZORIA	TX	290300	953600
CALCASIEU REFINING	LAKE CHARLES	LA	301430	931635
CALGON CARBON	NEVILLE ISLAND	PA	403000	800500
CALLEIA RES. RECOVER	BROOKLYN	NY	404324	735724
CALUMET REFINING COM	PRINCETON	LA	323512	933048
CANAL REF.	CHURCH POINT	LA	302412	925148
CASMALIA RESOURCES	CASMALIA	CA	345144	1203234

TABLE D-2. LOCATIONS USED IN HUMAN EXPOSURE MODEL

PLANT	CITY	STATE	LATITUDE	LONGITUDE
CECOS	STAMFORD	CT	414024	725700
CECOS INT'L	BRISTOL	CT	414024	725700
CECOS INT'L	CINCINNATI	OH	391014	843030
CECOS INT'L	LIVINGSTON	LA	302635	904314
CECOS INT'L	NIAGRA FALLS	NY	430522	785822
CECOS INT'L	WILLIAMSBURG	OH	390700	840300
CELANESE CHEMICAL	BISHOP	TX	273410	974910
CELANESE CORP.	PAMPA	TX	353207	1005747
CENEX REF.	LAUREL	MT	453920	1084530
CHAMPLIN PETROLEUM C	CORPUS CHRISTI	TX	274850	972520
CHATTEN CHEMICALS	CHATTANOOGA	TN	350200	851800
CHEMICAL PROCESSORS	SEATTLE	WA	473315	1221918
CHEMICAL RESOURCES	TULSA	OK	360756	955634
CHEMOIL	SIGNAL HILL	CA	334812	1181052
CHEM-CLEAR INC.	BALTIMORE	MD	391613	763753
CHEM-CLEAR INC.	CLEVELAND	OH	412851	814015
CHEM-MET SERVICES	WYANDOTTE	MI	421743	831705
CHEM. WASTE MGMT	EMELLE	AL	324730	881845
CHEM. WASTE MGMT.	CALUMET CITY	IL	414030	873345
CHEVRON	EL PASO	TX	314550	1062341
CHEVRON	EL SEGUNDO	CA	335439	1182441
CHEVRON	HONOLULU	HI	211845	1580645
CHEVRON	KENAI	AK	604727	1502652
CHEVRON	PASCAGOULA	MS	301904	882837
CHEVRON	PERTH AMBOY	NJ	403256	741610
CHEVRON	PHILADELPHIA	PA	395418	751231
CHEVRON	PORT ARTHUR	TX	295130	935830
CHEVRON	PORTLAND	OR	453200	1223700
CHEVRON	RICHMOND	CA	375612	1222337
CHEVRON	SALT LAKE CITY	UT	404930	1115530
CHEVRON	SEATTLE	WA	473315	1221918
CIBA CORNING	MEDFIELD	MA	421200	711900
CIBA-GEIGY	TOMS RIVER	NJ	395800	741200
CIBRO PETROLEUM	ALBANY	NY	424500	735000
CID-LANDFILL	CALUMET CITY	IL	414030	873345
CITGO PETROLEUM	LAKE CHARLES	LA	301113	932021
CITIZENS GAS	INDIANAPOLIS	IN	394516	860649
CLARK OIL & REFINING	BLUE ISLAND	IL	413919	874207
CLARK OIL & REFINING	BLUE ISLAND	IL	413919	824707
CLARK OIL & REF.	HARTFORD	IL	385006	900542
COASTAL EAGLE PT.	WESTVILLE	NJ	395214	750920
COASTAL REFINING	CORPUS CHRISTI	TX	274842	972644
COLORADO REF.	COMMERCE CITY	CO	394900	1045600
COMMERCIAL DISPOSAL	WEST SPRINGFIELD	MA	420837	723728
CONOCO	COMMERCE CITY	CO	394749	1045630
CONOCO	PONCA CITY	OK	364107	970525
CONOCO	SANTA MARIA	CA	345550	1203036
CONOCO CHEMICALS	WESTLAKE	LA	301425	931638
CONOCO REFINERY	BILLINGS	MT	454648	1082934
COSAN CHEMICAL	CARLSTADT	NJ	405004	740512
COSDEN OIL & CHEMICAL	BIG SPRING	TX	321614	1013517
CROSS OIL & REFINING	SMACKOVER	AR	332148	924244
CROWN CENTRAL	HOUSTON	TX	294440	951030
CRYSEN REFINING	WOODS CROSS	UT	405203	1115440
CRYSTAL REF.	CARSON CITY	MI	431042	845054
DELAWARE CONTAINERS	COATSVILLE	PA	395823	755054
DENKA CHEMICAL CO.	HOUSTON	TX	294158	951545
DERBY REFINING COMPA	WICHITA	KS	374219	971902
DERBY REF.	EL DORADO	KS	374710	965200
DETROIT COKE	DETROIT	MI	421119	830916
DEVOE & RAYNOLDS	LOUISVILLE	KY	381447	854549
DIAMOND SHAMROCK	SUNRAY	TX	355745	1015330
DIAMOND SHAMROCK COR	DEER PARK	TX	294358	950644
DIAMOND SHAMROCK REF	THREE RIVERS	TX	282730	981116
DOW CHEMICAL	DALTON	GA	343755	845306
DOW CHEMICAL	LEDYARD	CT	412638	720530
DOW CHEMICAL	PITTSBURG	CA	380115	1215115

TABLE D-2. LOCATIONS USED IN HUMAN EXPOSURE MODEL

PLANT	CITY	STATE	LATITUDE	LONGITUDE
DOW CHEMICAL	PLAQUEMINE	LA	301950	911430
DOW CHEMICAL USA	FREEPORT	TX	285917	952409
DOW CORNING	MIDLAND	MI	433608	841324
DSM CHEMICALS	AUGUSTA	GA	332135	820458
DUPONT	BEAUMONT	TX	300112	940156
DUPONT	DEEPWATER	NJ	394158	753026
DUPONT	GIBBSTOWN	NJ	395025	751750
DUPONT	LUGOFF	SC	341305	803805
E I DUPONT DE NEMOUR	ORANGE	TX	300324	934444
EASTMAN KODAK	ROCHESTER	NY	431200	773831
EASTMAN KODAK, INC.	LONGVIEW	TX	322617	944124
ECOLOTEC	DAYTON	OH	394603	840800
EDGINGTON OIL COMPAN	LONG BEACH	CA	335230	1180930
EL PASO REFINING	EL PASO	TX	314615	1062418
EMPIRE COKE COMPANY	TUSCALOOSA	AL	331500	873000
ENSCO	EL DORADO	AR	331219	923745
ENVIROSAFE SERVICES	OREGON	OH	414000	832750
ENV. ENTERPRISES	CINCINNATI	OH	404014	833929
ENV. WASTE RESOURCES	WATERBURY	CT	413306	730248
ERGON REF.	VICKSBURG	MS	322100	905100
ERIE COKE	ERIE	PA	420843	800132
ERIEWAY POLL. CONTRO	BEDFORD	OH	412230	813207
ETHYL CORP.	BATON ROUGE	LA	302032	911806
EXXON	BENICIA	CA	380430	1220830
EXXON	BILLINGS	MT	454900	1082545
EXXON	LINDEN	NJ	403818	741340
EXXON CORP	BATON ROUGE	LA	302914	911017
EXXON CORP	BAYTOWN	TX	294450	950104
E.I. DUPONT	PARKERSBURG	WV	391612	814009
FARMLAND FACILITIES	PHILLIPSBURG	KS	395005	991849
FARMLAND INDUSTRIES	COFFEYVILLE	KS	370300	953615
FINA OIL	BIG SPRING	TX	321611	1012455
FINA OIL & CHEMICAL	PORT ARTHUR	TX	295730	935320
FIRST CHEMICAL CORP	PASCAGOULA	MS	302057	882945
FLETCHER OIL & REFIN	WILMINGTON	CA	334824	1181700
FMC CORP.	BALTIMORE	MD	391853	763737
FRONTIER CHEMICAL	NIAGRA FALLS	NY	430534	790326
FRONTIER OIL	CHEYENNE	WY	410730	1044730
GAF CORP.	CALVERT CITY	KY	370251	882448
GENERAL ELECTRIC	WATERFORD	NY	424825	734200
GEORGIA GULF CORP.	PASADENA	TX	294323	950918
GEORGIA-PACIFIC CORP	PASADENA	TX	294323	950918
GEORGIA-PACIFIC CORP	PLAQUEMINE	LA	301530	912139
GIANT REFINERY	GALLUP	NM	352541	1084434
GLIDDEN COATINGS	CARROLLTON	TX	325500	965500
GOLDEN WEST REFINING	SANTA FE SPRING	CA	335400	1180200
GOODRICH, (B.F.)	HENRY	IL	410750	892004
GOODYEAR TIRE	BEAUMONT	TX	295833	941304
GOODYEAR TIRE & RUBB	LAPORTE	TX	293900	950200
GREAT LAKES CHEMICAL	EL DORADO	AR	331000	924500
GULF COAST WASTE DIS	TEXAS CITY	TX	292615	945935
GULF STATES	GADSDEN	AL	340046	860238
HANSBROUGH ENERGY	CROWLEY	LA	301100	922500
HAWAII INDEP. REF.	EWA BEACH	HI	211845	1580645
HEAT ENERGY TECH.	DALLAS	TX	325244	965230
HERCULES	GIBBSTOWN	NJ	395020	751635
HERCULES	MAGNA	UT	404000	1120500
HERITAGE ENV. SERVIC	INDIANAPOLIS	IN	394501	861717
HILL PETROLEUM	HOUSTON	TX	294139	951415
HILL PETROLEUM	KROTZ SPRINGS	LA	302500	914500
HILL PETROLEUM	ST. ROSE	LA	324830	932430
HILL PETROLEUM	TEXAS CITY	TX	292342	945336
HOWELL HYDROCARBONS	SAN ANTONIO	TX	292051	982736
HUNT REFINING	TUSCALOOSA	AL	343758	864135
HUNTWAY REF.	BENECIA	CA	380430	1220830
HUNTWAY REF.	WILMINGTON	CA	334800	1181800
INDIANA FARM BUREAU	MT. VERNON	IN	375630	875438

TABLE D-2. LOCATIONS USED IN HUMAN EXPOSURE MODEL

PLANT	CITY	STATE	LATITUDE	LONGITUDE
INDUSTRIAL WASTE REM	LEWISBERRY	PA	401010	765017
INLAND STEEL	E CHICAGO	IN	414010	872640
INTERMOUNTAIN REF.	FREDONIA	AZ	365000	1123000
INT'L FLAVORS & FRAG	UNION BEACH	NJ	402700	741100
IT CORPORATION	BENECIA	CA	380618	1220703
IT CORPORATION	WESTMORELAND	CA	330215	1154412
IT CORP.-PETROL. WAS	BUTTONWILLOW	CA	352400	1192800
KERN OIL & REFINING	BAKERSFIELD	CA	352230	1190118
KERR MCGEE	WYNNEWOOD	OK	343747	971015
KERR-MCGEE CHEM. COR	MERIDIAN	MS	322015	822854
KERR-MCGEE REFINING	COTTON VALLEY	LA	324830	932430
KOCH INDUSTRIES	CORPUS CHRISTI	TX	275005	973115
KOCH INDUSTRIES	CORPUS CHRISTI	TX	275005	973115
KOCH REFINING	ROSEMOUNT	MN	444600	930230
KOPPERS	HOUSTON	TX	294607	951014
KOPPERS	WOODWARD	AL	332653	865759
KOPPERS CO INC	BRIDGEVILLE	PA	402132	800441
LA GLORIA OIL AND GA	TYLER	TX	322145	951645
LAKESIDE REF.	KALAMAZOO	MI	421724	853500
LAKETON REFINING	LAKETON	IN	405800	855000
LILLY COATINGS	MONTEBELLO	CA	340100	1180700
LILLY IND. COATINGS	DALLAS	TX	324630	965415
LION OIL	EL DORADO	AR	331300	924000
LIQUID ENERGY CORP.	BRIDGEPORT	TX	331500	973800
LITTLE AMERICA REF.	CASPER	WY	425027	1062105
LOUISIANA LAND & EXP	SARALAND	AL	304900	880400
LTV STEEL	CLEVELAND	OH	412810	813948
LTV STEEL	S CHICAGO	IL	414127	873254
LTV STEEL	WARREN	OH	411221	804858
LTV STEEL COMPANY	PITTSBURGH	PA	402445	795646
LUNDAY-THAGARD CO.	SOUTH GATE	CA	340500	1181500
LYONDELL PETROCHEMIC	HOUSTON	TX	294700	950400
MALLINCKRODT CHEM.	RALEIGH	NC	355406	783339
MALONE SERVICE CO.	TEXAS CITY	TX	291945	945418
MANTUA OIL	THOROFARE	NJ	394500	751500
MAPCO PETROLEUM	MEMPHIS	TN	350512	900500
MAPCO PETROLEUM	NORTH POLE	AK	643937	1471629
MARATHON OIL	TEXAS CITY	TX	292221	945447
MARATHON PETROLEUM	GARYVILLE	LA	300341	903601
MARATHON PETROLEUM	ROBINSON	IL	390000	874332
MARATHON PET.	DETROIT	MI	421119	830916
MARISOL INC.	MIDDLESEX	NJ	403335	743112
MEAD JOHNSON	EVANSVILLE	IN	380000	873300
MICHIGAN DISPOSAL IN	BELLEVILLE	MI	421315	833114
MIDATLANTIC REF.	ST. MARYS	WV	392300	811230
MINE SAFETY APPL.	EVANS CITY	PA	405437	795452
MOBAY CHEMICAL CORP	NEW MARTINSVI	WV	395209	803958
MOBAY CORP.	HALEDON	NJ	405630	741101
MOBIL	CHALMETTE	LA	295556	895819
MOBIL CHEMICALS	BEAUMONT	TX	300405	940334
MOBIL OIL	BEAUMONT	TX	300354	940420
MOBIL OIL	JOLIET	IL	412520	881120
MOBIL OIL	PAULSBORO	NJ	395040	751618
MOBIL OIL	TORRANCE	CA	335110	1181952
MONSANTO CO	ADDYSTON	OH	390730	844258
MONSANTO CO	ALVIN	TX	291509	951244
MONSANTO CO	ANNISTON	AL	333904	855821
MONSANTO CO	BRIDGEPORT	NJ	394822	752424
MONSANTO CO	SAUGET	IL	383606	901011
MONSANTO CO	ST. LOUIS	MO	383611	901154
MONTANA REFINING COM	GREAT FALLS	MT	473000	1111700
MONTROSE CHEMICAL CO	HENDERSON	NV	360228	1150040
MURPHY OIL CORPORATI	MEHAUX	LA	295558	895621
MURPHY OIL CORPORATI	SUPERIOR	WI	464126	920408
NATIONAL COOPERATIVE	MCPHERSON	KS	382229	974024
NATIONAL STEEL	GRANITE CITY	IL	384141	900747
NATIONAL STEEL GROUP	ECORSE	MI	421712	890624

TABLE D-2. LOCATIONS USED IN HUMAN EXPOSURE MODEL

PLANT	CITY	STATE	LATITUDE	LONGITUDE
NAVAJO REFINING	ARTESIA	NM	325230	1041750
NEPERA CHEMICAL CO.,	HARRIMAN	NY	411837	740832
NEVADA REF.	TONOPAH	NV	380300	1171500
NEW BOSTON COKE	PORTSMOUTH	OH	384557	825601
NEWHALL REFINING CO.	NEWHALL	CA	342055	1183025
NIPRO, INC.	AUGUSTA	GA	332135	820458
NORCHEM CO.	CLINTON	IA	414818	901745
NORCHEM, INC.	MORRIS	IL	412128	882542
OLIN CHEMICALS	AUGUSTA	GA	332054	815624
OLIN CORP.	ST. MARKS	FL	301033	841325
ORBIS PRODUCTS CORP	NEWARK	NJ	404400	741000
ORTHO DIAGNOSTICS	RARITAN	NJ	403438	743905
OXNARD REF.	OXNARD	CA	341218	1191100
PACIFIC REF.	HERCULES	CA	375831	1221254
PARAMOUNT PET.	PARAMOUNT	CA	335143	1181045
PARKE-DAVIS	HOLLAND	MI	424751	860652
PENNZOIL	ROOSEVELT	UT	401600	1100120
PENNZOIL	SHREVEPORT	LA	322812	934613
PENNZOIL COMPANY	ROUSEVILLE	PA	412750	794122
PEORIA DISPOSAL CO.	PEORIA	IL	404720	894544
PETRO STAR	NORTH POLE	AK	643937	1471629
PETROCHEM RECYCLING	SALT LAKE CITY	UT	404815	1115500
PHILLIPS	SWEENEY	TX	290424	954510
PHILLIPS 66	WOODS CROSS	UT	405348	1115626
PHILLIPS 66 REFINERY	BORGER	TX	354205	1012205
PLACID REFINING	PORT ALLEN	LA	302835	911240
POWERINE OIL	SANTA FE SPRING	CA	335400	1180200
PPG INDUSTRIES	DELAWARE	OH	401704	830545
PPG INDUSTRIES	NORTON	OH	410001	813701
PRIDE REFINING	ABILENE	TX	322754	994248
QUAKER STATE OIL REF	NEWELL	WV	403700	803730
QUAKER STATE OIL REF	SMETHPORT	PA	414637	782812
REICHOLD CHEMICALS	ELIZABETH	NJ	403915	741305
REICHOLD CHEMICALS	GULFPORT	MS	302520	890100
REILLY TAR AND CHEM	GRANITE CITY	IL	384946	895420
REILLY TAR AND CHEM	INDIANAPOLIS	IN	394419	861306
RHONE-POULENC, INC.	MT. PLEASANT	TN	351212	871220
RMT PROPERTIES	NORTH SALT LAKE	UT	405027	1115510
ROCK ISLAND REFINING	INDIANAPOLIS	IN	395500	861500
ROGERS LANDFILL	CENTREVILLE	MS	310946	911856
ROLLINS ENV. SERVICE	BRIDGEPORT	NJ	394800	752100
ROLLINS ENV. SERVICE	DEER PARK	TX	294343	950549
RUBICON CHEMICALS IN	GEISMAR	LA	301223	910039
SAN JOAQUIN REF.	BAKERSFIELD	CA	352235	1190405
SHARON STEEL	MONESSEN	PA	400946	795347
SHELL CHEM CO	NORCO	LA	295942	902735
SHELL OIL	ANACORTES	WA	483000	1223304
SHELL OIL	DEER PARK	TX	294255	950733
SHELL OIL	MARTINEZ	CA	380121	1220607
SHELL OIL	WILMINGTON	CA	334800	1181800
SHELL OIL	WOOD RIVER	IL	385026	900424
SHELL OIL REFINERY	ODESSA	TX	314905	1021920
SHENANGO	SHENANGO	PA	402849	800334
SINCLAIR OIL	SINCLAIR	WY	414700	1070730
SINCLAIR OIL	TULSA	OK	360728	955945
SLOSS INDUSTRIES	BIRMINGHAM	AL	333341	864804
SOHIO	FERDALE	WA	484937	1224133
SOLVENT RECOV. SERV	LINDEN	NJ	403651	741507
SOMERSET REFINERY	SOMERSET	KY	370300	843700
SOUND REF.	TACOMA	WA	471535	1222409
SOUTHLAND CORP.	GREAT MEADOWS	NJ	405408	745226
SOUTHLAND OIL	LUMBERTON	MS	310100	892800
SOUTHLAND OIL	SANDERSVILLE	MS	314700	890200
SOUTHWESTERN REFININ	CORPUS CHRISTI	TX	274816	972524
STANDARD CHLORIDE CH	DELAWARE CITY	DE	393354	753847
STANDARD OIL OF OHIO	LIMA	OH	404636	840627
STANDARD OIL OF OHIO	TOLEDO	OH	414045	832645

TABLE D-2. LOCATIONS USED IN HUMAN EXPOSURE MODEL

PLANT	CITY	STATE	LATITUDE	LONGITUDE
STAR REF.	CONVENT	LA	300632	905402
STAR REF.	DELAWARE CITY	DE	393515	753745
STAR REF.	PORT ARTHUR	TX	295301	935752
STAUFFER CHEMICAL	BATON ROUGE	LA	303034	911110
STAUFFER CHEMICAL CO	EDISON	NJ	403100	742500
STEPAN CO.	ELWOOD	IL	412630	881700
SUN CO.	TOLEDO	OH	413652	833140
SUN PETROLEUM	MARCUS HOOK	PA	394845	752451
SUN REFINING	TULSA	OK	360825	960115
SUNLAND REF.	BAKERSFIELD	CA	352235	1190405
S.D.S. BIOTECH CORP.	HOUSTON	TX	294130	951000
TESARO ALASKA PETROL	KENAI	AK	604727	1502652
TEXACO REFINING	BAKERSFIELD	CA	352235	1190405
TEXACO REFINING	EL DORADO	KS	374710	965200
TEXACO REFINING	WILMINGTON	CA	334730	1181408
TEXACO USA	ANACORTES	WA	483034	1223437
TEXAS ECOLOGISTS	ROBSTOWN	TX	274700	974000
TOLEDO COKE	TOLEDO	OH	414010	832931
TONAWANDA	TONAWANDA	NY	425856	785619
TOSCO CORP.	MARTINEZ	CA	380121	1220607
TOTAL PETROLEUM	ALMA	MI	432244	843730
TOTAL PETROLEUM	AROMORE	OK	341220	970500
TOTAL PETROLEUM	ARKANSAS CITY	KS	370242	970042
TRESCO INC.	BARBOURVILLE	KY	364500	834000
TRICIL ENV. SERVICES	MUSKEGON HEIGHT	MI	431300	861800
TRIFINERY	CORPUS CHRISTI	TX	274816	972524
TROY CHEMICAL CORP.,	NEWARK	NJ	404400	741000
UNION CARBIDE	PENUELAS	PR	180000	664425
UNION CARBIDE	SEADRIFT	TX	283038	964659
UNION CARBIDE CARIBE	PONCE	PR	180000	664425
UNION CARBIDE CORP.	TEXAS CITY	TX	292227	945633
UNION CARBIDE CORP.	HAHNVILLE	LA	295642	902923
UNION OIL OF CALIFOR	LEMONT	IL	414020	880010
UNION OIL OF CALIFOR	NEDERLAND	TX	300000	935845
UNION OIL OF CALIFOR	RODEO	CA	380300	1221530
UNION OIL OF CALIFOR	WILMINGTON	CA	334630	1181730
UNITED REF.	WARREN	PA	415000	791500
UNOCAL	LOS ANGELES	CA	340400	1181500
UPJOHN CO	LA PORTE	TX	294236	950450
UPJOHN CO., THE	NORTH HAVEN	CT	412230	725230
US ARMY MUNITIONS	KINGSTON	TN	363158	823746
US INDUSTRIAL CHEM.	TUSCOLA	IL	394755	882100
USPCI GRASSY MT.	KNOWLES	UT	404908	1131233
USS CHEMICAL	IRONTON	OH	383530	824901
USS CHEMICALS	FLORENCE	KY	385838	843715
U.S. OIL & REFINING	TACOMA	WA	471535	1222409
U.S. STEEL CORP.	CLAIRTON	PA	401825	795230
U.S. STEEL CORP.	GARY	IN	413701	872000
U.S. STEEL CORP.	PROVO	UT	401802	1114428
VALERO ENERGY CORP.	CORPUS CHRISTI	TX	274900	972930
VISTA CHEMICAL	BALTIMORE	MD	391138	763249
VISTA CHEMICAL	WESTLAKE	LA	301520	931631
VULCAN MATERIALS	WICHITA	KS	373500	972501
WASTE CONVERSION	HATFIELD	PA	401730	751709
WASTE TECH SERVICES	GOLDEN	CO	394742	1050351
WAYNE DISPOSAL	BELLEVILLE	MI	421330	833100
WHEELING PITT	E STEUBENVILLE	WV	402036	803625
WITCO CHEMICAL CORPO	POINT COMFORT	TX	283900	963400
WITCO CHEMICAL CORP.	BRADFORD	PA	415748	783742
WITCO CORP.	OILDALE	CA	352505	1190035
WITCO CORP.	OILDALE	CA	352505	1190035
WYOMING REF.	NEWCASTLE	WY	435047	1041249
YOUNG REF.	DOUGLASVILLE	GA	334500	844500

TABLE D-3. HEM RESULTS FOR CASE 1 (BASELINE MINIMUM)

Summary for BENZENE
with a Unit Risk of 8.30E-06

REFINERIES

SIC=

CAS=

Page 1 of 9

- M a x i m u m -					- - M i n i m u m - -							
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval	S o u r c e		
1.68E+02	<1	3.58E+01	2.97E-04	1.39E-03	5.86E-03	382,000	4.07E+04	0.0048	210.	352	ASHLAND CHEMICAL	BOYD
1.54E+02	1	1.56E+02	1.30E-03	1.28E-03	2.65E-03	361,000	1.06E+04	0.0013	790.	132	MOBAY CHEMICAL CORP	NEW M
1.30E+02	6	7.92E+02	6.58E-03	1.08E-03	2.33E-03	327,000	1.17E+05	0.014	72.	7	WITCO CORP.	OILDA
9.96E+01	1	8.20E+01	6.80E-04	8.27E-04	2.39E-03	392,000	1.70E+04	0.0020	500.	108	DUPONT	BEAUM
7.14E+01	<1	2.85E+01	2.37E-04	5.93E-04	1.84E-03	857,000	9.52E+03	0.0011	890.	121	MONSANTO CO	ALVIN
6.13E+01	3	2.11E+02	1.75E-03	5.09E-04	2.22E-03	4,750,000	6.06E+04	0.0072	140.	394	WASTE CONVERSION	HATTI
5.42E+01	18	9.56E+02	7.93E-03	4.50E-04	2.25E-03	52,700	3.40E+04	0.0040	250.	103	CELANESE CORP.	PAMPA
5.28E+01	3	1.35E+02	1.12E-03	4.38E-04	3.44E-04	893,000	1.36E+04	0.0016	620.	92	UNION CARBIDE CARIBE	PONCE
3.43E+01	<1	1.77E+00	1.47E-05	2.84E-04	1.35E-03	1,220,000	1.02E+04	0.0012	830.	10	STANDARD CHLORIDE CH	DELAH
3.22E+01	1	4.63E+01	3.84E-04	2.67E-04	1.88E-03	707,000	2.10E+04	0.0025	400.	47	PARKE-DAVIS	HOLLA
2.97E+01	<1	4.42E-01	3.67E-06	2.47E-04	1.42E-03	3,380,000	2.66E+04	0.0032	320.	388	MICHIGAN DISPOSAL IN	BELLE
2.91E+01	1	1.64E+01	1.36E-04	2.41E-04	8.67E-04	772,000	1.37E+04	0.0016	620.	124	UNION CARBIDE CORP	TEXAS
2.86E+01	<1	1.35E+01	1.12E-04	2.37E-04	9.00E-04	695,000	1.11E+04	0.0013	760.	266	AMOCO	TEXAS
2.46E+01	<1	1.18E+00	9.83E-06	2.04E-04	4.84E-04	2,590,000	1.75E+04	0.0021	480.	290	SHELL OIL	DEER
2.14E+01	<1	8.84E-01	7.33E-06	1.77E-04	6.28E-04	346,000	1.46E+03	0.0002	5,800.	355	HANSBROUGH ENERGY	CROWL
2.00E+01	18	3.57E+02	2.96E-03	1.66E-04	7.16E-04	556,000	2.15E+04	0.0026	390.	209	EXXON CORP	BATON
1.95E+01	<1	2.99E+00	2.48E-05	1.62E-04	4.11E-04	4,900,000	1.98E+04	0.0023	430.	58	BASF WYANDOTTE CORP.	JAMES
1.93E+01	<1	3.85E+00	3.20E-05	1.60E-04	1.77E-04	125,000	3.82E+02	<0.0001	22,000.	304	ARCO PETROLEUM	FERND
1.89E+01	2	4.00E+01	3.32E-04	1.57E-04	5.71E-04	3,070,000	1.69E+04	0.0020	500.	150	CHEVRON	RICHM
1.87E+01	<1	3.73E+00	3.10E-05	1.55E-04	7.95E-04	1,140,000	5.43E+03	0.0006	1,600.	218	BP OIL	BELLE
1.82E+01	1	1.23E+01	1.02E-04	1.51E-04	6.33E-04	397,000	6.30E+03	0.0007	1,300.	286	MOBIL OIL	BEAUM
1.75E+01	11	1.96E+02	1.63E-03	1.45E-04	4.55E-04	7,970,000	3.97E+04	0.0047	210.	149	CHEVRON	EL SE
1.60E+01	1	1.48E+01	1.23E-04	1.33E-04	5.36E-04	228,000	2.36E+03	0.0003	3,600.	207	CITGO PETROLEUM	LAKE
1.59E+01	10	1.58E+02	1.31E-03	1.32E-04	5.47E-04	5,420,000	3.48E+04	0.0041	240.	190	AMOCO CHEMICAL	WHITI
1.57E+01	4	6.31E+01	5.24E-04	1.30E-04	3.10E-04	8,320,000	3.98E+04	0.0047	210.	72	STAUFFER CHEMICAL CO	EDISO
1.41E+01	<1	1.46E+00	1.21E-05	1.17E-04	9.48E-05	339,000	6.25E+03	0.0007	1,400.	267	CHAMPLIN PETROLEUM C	CORPU
1.41E+01	54	7.66E+02	6.36E-03	1.17E-04	1.93E-04	1,940,000	2.08E+04	0.0025	400.	381	CECOS	STAMP
1.40E+01	1	1.75E+01	1.45E-04	1.17E-04	3.67E-04	313,000	1.52E+03	0.0002	5,600.	51	FIRST CHEMICAL CORP	PASCA
1.40E+01	<1	6.24E+00	5.18E-05	1.16E-04	8.14E-05	364,000	1.67E+03	0.0002	5,000.	281	KOCH INDUSTRIES	CORPU
1.33E+01	1	1.46E+01	1.21E-04	1.10E-04	8.41E-05	344,000	4.26E+03	0.0005	2,000.	270	COASTAL REFINING	CORPU
1.20E+01	97	1.16E+03	9.63E-03	9.96E-05	4.04E-04	333,000	1.35E+04	0.0016	620.	247	STANDARD OIL OF OHIO	LIMA
1.17E+01	<1	4.05E+00	3.36E-05	9.70E-05	4.19E-04	377,000	3.25E+03	0.0004	2,600.	201	ASHLAND PETROLEUM CO	ASHLA
1.15E+01	1	1.12E+01	9.32E-05	9.53E-05	2.70E-04	1,270,000	3.51E+03	0.0004	2,400.	71	SOUTHLAND CORP.	GREAT
1.14E+01	<1	5.40E-01	4.48E-06	9.43E-05	4.66E-04	2,060,000	6.95E+03	0.0008	1,200.	188	SHELL OIL	WOOD
1.13E+01	111	1.25E+03	1.04E-02	9.38E-05	1.82E-04	8,090,000	3.78E+04	0.0045	220.	169	SHELL OIL	WILMI
1.12E+01	<1	1.43E+00	1.19E-05	9.32E-05	6.41E-04	1,190,000	2.23E+04	0.0026	380.	214	MOBIL	CHALM
1.10E+01	1	1.01E+01	8.34E-05	9.12E-05	2.20E-04	2,670,000	9.45E+03	0.0011	890.	271	CROWN CENTRAL	HOUST
1.10E+01	2	1.66E+01	1.38E-04	9.11E-05	3.22E-04	399,000	1.85E+03	0.0002	4,600.	109	E I DUPONT DE NEMOUR	ORANG
1.10E+01	17	1.82E+02	1.51E-03	9.09E-05	2.94E-04	8,460,000	2.78E+04	0.0033	300.	161	MOBIL OIL	TORRA
1.09E+01	4	4.09E+01	3.39E-04	9.08E-05	2.69E-04	2,920,000	7.74E+03	0.0009	1,100.	176	UNION OIL OF CALIFOR	RODEO
1.08E+01	4	4.21E+01	3.49E-04	8.98E-05	1.78E-04	8,070,000	2.38E+04	0.0028	350.	172	TEXACO REFINING	WILMI
1.04E+01	2	1.81E+01	1.50E-04	8.66E-05	4.03E-04	720,000	2.00E+03	0.0002	4,200.	213	MARATHON PETROLEUM	GARYV
1.04E+01	<1	1.16E+00	9.64E-06	8.62E-05	4.08E-04	359,000	2.57E+03	0.0003	3,300.	293	STAR REF.	PORT
1.02E+01	1	6.53E+00	5.42E-05	8.44E-05	3.14E-04	1,270,000	2.39E+03	0.0003	3,500.	217	SHELL CHEM CO	NORCO
9.75E+00	1	1.14E+01	9.45E-05	8.09E-05	4.39E-04	159,000	2.27E+03	0.0003	3,700.	186	MARATHON PETROLEUM	ROBIN

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TABLE D-3. (continued)

Summary for BENZENE
with a Unit Risk of 8.30E-06

SIC= CAS=

- M a x i m u m -					- - M i n i m u m - -					S o u r c e	
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval		
9.61E+00	207	1.99E+03	1.65E-02	7.97E-05	2.73E-04	8,640,000	5.84E+04	0.0069	140.	175 UNOCAL	LOS A
9.46E+00	1	7.90E+00	6.56E-05	7.85E-05	7.50E-05	228,000	4.34E+02	0.0001	19,000.	309 TEXACO USA	ANACO
9.27E+00	46	4.25E+02	3.53E-03	7.69E-05	6.12E-05	338,000	9.11E+03	0.0011	930.	292 SOUTHWESTERN REFININ	CORPU
9.12E+00	1	8.34E+00	6.93E-05	7.57E-05	2.52E-04	171,000	4.39E+02	0.0001	19,000.	288 PHILLIPS	SWEEN
8.55E+00	<1	4.91E-02	4.08E-07	7.10E-05	6.24E-05	230,000	2.92E+02	<0.0001	29,000.	306 SHELL OIL	ANACO
8.22E+00	33	2.68E+02	2.23E-03	6.83E-05	4.02E-04	817,000	1.15E+04	0.0014	730.	249 SUN CO.	TOLED
8.09E+00	1	4.52E+00	3.75E-05	6.72E-05	2.34E-04	388,000	2.17E+03	0.0003	3,900.	295 UNION OIL OF CALIFOR	NEDER
7.87E+00	13	9.90E+01	8.22E-04	6.53E-05	3.10E-04	4,840,000	2.32E+04	0.0028	360.	237 COASTAL EAGLE PT.	WESTV
7.63E+00	<1	9.01E-01	7.48E-06	6.33E-05	2.67E-04	1,510,000	2.35E+03	0.0003	3,600.	187 MOBIL OIL	JOLIE
7.43E+00	2	1.68E+01	1.39E-04	6.17E-05	3.24E-04	826,000	5.39E+03	0.0006	1,600.	354 ENVIROSAFE SERVICES	OREGO
7.36E+00	<1	8.75E-01	7.26E-06	6.11E-05	2.60E-04	1,900,000	3.67E+03	0.0004	2,300.	224 KOCH REFINING	ROSEM
7.19E+00	9	6.33E+01	5.26E-04	5.97E-05	1.02E-04	12,700,000	2.93E+04	0.0035	290.	238 EXXON	LINDE
7.08E+00	2	1.63E+01	1.35E-04	5.87E-05	2.17E-04	225,000	1.92E+03	0.0002	4,400.	208 CONOCO CHEMICALS	WESTL
7.04E+00	21	1.50E+02	1.24E-03	5.85E-05	2.76E-04	4,450,000	1.37E+04	0.0016	620.	263 SUN PETROLEUM	MARCU
6.84E+00	<1	1.12E-01	9.31E-07	5.68E-05	2.68E-04	1,400,000	2.53E+03	0.0003	3,300.	179 STAR REF.	DELAU
6.22E+00	18	1.09E+02	9.08E-04	5.16E-05	2.19E-04	6,550,000	1.16E+04	0.0014	730.	189 UNION OIL OF CALIFOR	LEMON
6.07E+00	6	3.45E+01	2.86E-04	5.04E-05	1.04E-04	7,880,000	1.15E+04	0.0014	730.	174 UNION OIL OF CALIFOR	WILMI
5.86E+00	44	2.59E+02	2.15E-03	4.86E-05	2.28E-04	4,900,000	3.79E+04	0.0045	220.	257 ATLANTIC REFINING	PHILA
5.83E+00	27	1.58E+02	1.31E-03	4.84E-05	2.24E-04	4,440,000	1.38E+04	0.0016	610.	262 BP OIL	MARCU
5.68E+00	<1	3.89E-01	3.23E-06	4.71E-05	1.10E-04	3,080,000	2.97E+03	0.0004	2,800.	45 VISTA CHEMICAL	BALTI
5.55E+00	1	8.10E+00	6.72E-05	4.60E-05	2.67E-04	838,000	2.78E+03	0.0003	3,000.	248 STANDARD OIL OF OHIO	TOLED
5.48E+00	<1	2.26E+00	1.88E-05	4.55E-05	4.27E-05	151,000	1.61E+02	<0.0001	52,000.	307 SOHIO	FERND
4.40E+00	<1	7.95E-02	6.60E-07	3.65E-05	4.03E-05	249,000	4.89E+02	0.0001	17,000.	110 EASTMAN KODAK, INC.	LONGV
4.37E+00	18	7.66E+01	6.36E-04	3.63E-05	2.62E-04	1,190,000	8.54E+03	0.0010	990.	215 MURPHY OIL CORPORATI	MERAU
4.18E+00	<1	1.01E-01	8.37E-07	3.47E-05	7.75E-05	379,000	4.21E+02	0.0001	20,000.	199 TEXACO REFINING	EL DO
3.95E+00	1	3.20E+00	2.66E-05	3.28E-05	5.88E-04	2,450,000	1.38E+04	0.0016	610.	284 LYONDELL PETROCHEMIC	HOUST
3.84E+00	3	1.12E+01	9.27E-05	3.19E-05	6.65E-05	134,000	7.13E+02	0.0001	12,000.	196 FARMLAND INDUSTRIES	COFFE
3.81E+00	<1	1.28E+00	1.06E-05	3.16E-05	4.36E-05	17,500	4.13E+01	<0.0001	1200,000.	317 SINCLAIR OIL	SINCL
3.80E+00	<1	6.70E-02	5.56E-07	3.16E-05	9.87E-05	763,000	6.24E+02	0.0001	14,000.	183 HAWAII INDEP. REF.	EMA B
3.79E+00	<1	9.56E-02	7.94E-07	3.15E-05	1.30E-04	137,000	7.05E+02	0.0001	12,000.	107 DOW CHEMICAL USA	FREEP
3.69E+00	<1	1.16E+00	9.61E-06	3.06E-05	1.53E-04	4,830,000	7.56E+03	0.0009	1,100.	240 MOBIL OIL	PAULS
3.59E+00	21	7.62E+01	6.32E-04	2.98E-05	2.09E-05	382,000	1.45E+03	0.0002	5,800.	397 TEXAS ECOLOGISTS	ROBST
3.56E+00	1	3.81E+00	3.16E-05	2.95E-05	4.80E-05	3,220,000	1.62E+03	0.0002	5,200.	164 PACIFIC REF.	HERCU
3.49E+00	89	3.11E+02	2.58E-03	2.90E-05	1.14E-04	2,680,000	7.18E+03	0.0009	1,200.	278 HILL PETROLEUM	HOUST
3.49E+00	1	3.01E+00	2.50E-05	2.90E-05	2.94E-05	259,000	8.18E+02	0.0001	10,000.	282 LA GLORIA OIL AND GA	TYLER
3.46E+00	13	4.56E+01	3.78E-04	2.87E-05	1.26E-04	697,000	2.20E+03	0.0003	3,800.	279 HILL PETROLEUM	TEXAS
3.35E+00	4	1.36E+01	1.13E-04	2.78E-05	3.05E-05	88,000	3.55E+02	<0.0001	24,000.	255 TOTAL PETROLEUM	ARDMO
3.28E+00	5	1.75E+01	1.45E-04	2.72E-05	1.16E-04	6,360,000	1.14E+04	0.0013	740.	184 CLARK OIL & REFINING	BLUE
3.24E+00	1	3.93E+00	3.26E-05	2.69E-05	6.31E-05	325,000	1.79E+03	0.0002	4,700.	171 TEXACO REFINING	BAKER
3.16E+00	<1	6.40E-01	5.31E-06	2.63E-05	1.38E-03	2,560,000	3.49E+04	0.0041	240.	374 ROLLINS ENV. SERVICE	DEER
3.15E+00	<1	5.66E-01	4.70E-06	2.61E-05	6.02E-05	192,000	2.15E+02	<0.0001	39,000.	264 UNITED REF.	WARRE
2.97E+00	1	3.24E+00	2.69E-05	2.46E-05	1.32E-04	55,300	2.57E+02	<0.0001	33,000.	287 PHILLIPS 66 REFINERY	BORGE
2.90E+00	<1	5.05E-01	4.19E-06	2.41E-05	3.70E-05	1,760,000	1.15E+03	0.0001	7,300.	310 U.S. OIL & REFINING	TACOM
2.88E+00	<1	1.25E+00	1.04E-05	2.39E-05	1.10E-04	38,900	9.73E+01	<0.0001	87,000.	276 FINA OIL	BIG S
2.84E+00	112	3.18E+02	2.64E-03	2.36E-05	8.87E-04	2,030,000	1.94E+04	0.0023	430.	98 AMERICAN HOECHST COR	HOUST

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TABLE D-3. (continued)

Summary for BENZENE
with a Unit Risk of 8.30E-06

SIC=

CAS=

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- M a x i m u m -					- - M i n i m u m - -								S o u r c e
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval				
2.83E+00	13	3.64E+01	3.02E-04	2.35E-05	1.05E-04	1,970,000	2.70E+03	0.0003	3,100.	319	ASHLAND PETROLEUM	ST. P	
2.80E+00	3	9.68E+00	8.04E-05	2.32E-05	5.07E-05	147,000	5.73E+02	0.0001	15,000.	198	NATIONAL COOPERATIVE	MCPHE	
2.76E+00	105	2.91E+02	2.41E-03	2.29E-05	4.07E-05	8,550,000	1.14E+04	0.0013	740.	165	PARAMOUNT PET.	PARAM	
2.75E+00	<1	1.07E+00	8.87E-06	2.28E-05	2.18E-05	34,700	1.19E+02	<0.0001	71,000.	273	DIAMOND SHAMROCK REF	THREE	
2.70E+00	1	3.45E+00	2.86E-05	2.24E-05	9.01E-05	1,380,000	6.19E+02	0.0001	14,000.	387	CECOS INT'L	WILLI	
2.70E+00	4	1.04E+01	8.60E-05	2.24E-05	9.91E-05	2,280,000	3.53E+03	0.0004	2,400.	346	U.S. STEEL CORP.	CLAIR	
2.69E+00	15	3.96E+01	3.28E-04	2.23E-05	4.39E-05	625,000	1.74E+03	0.0002	4,800.	253	SINCLAIR OIL	TULSA	
2.55E+00	3	7.70E+00	6.39E-05	2.12E-05	3.27E-04	364,000	1.95E+03	0.0002	4,300.	277	FINA OIL & CHEMICAL	PORT	
2.47E+00	25	6.06E+01	5.03E-04	2.05E-05	1.58E-04	494,000	3.48E+03	0.0004	2,400.	268	CHEVRON	EL PA	
2.40E+00	4	8.49E+00	7.05E-05	1.99E-05	1.11E-04	3,810,000	3.64E+03	0.0004	2,300.	222	MARATHON PET.	DETRO	
2.37E+00	7	1.55E+01	1.29E-04	1.96E-05	7.92E-05	676,000	1.25E+03	0.0001	6,800.	285	MARATHON OIL	TEXAS	
2.33E+00	1	1.48E+00	1.23E-05	1.94E-05	5.61E-05	1,640,000	1.52E+03	0.0002	5,500.	178	CONOCO	COMME	
2.27E+00	<1	1.23E-01	1.02E-06	1.88E-05	3.97E-05	75,300	7.71E+02	0.0001	11,000.	314	AMOCO	CASPE	
2.23E+00	3	5.70E+00	4.73E-05	1.85E-05	1.45E-05	893,000	5.75E+02	0.0001	15,000.	91	UNION CARBIDE	PENUE	
2.21E+00	1	1.16E+00	9.60E-06	1.83E-05	2.34E-05	92,200	6.74E+01	<0.0001	130,000.	252	KERR MCGEE	WYNNE	
2.21E+00	34	7.43E+01	6.16E-04	1.83E-05	5.75E-05	381,000	2.57E+03	0.0003	3,300.	203	PENNZOIL	SHREV	
2.18E+00	7	1.61E+01	1.34E-04	1.81E-05	1.14E-04	1,170,000	2.94E+03	0.0003	2,900.	27	REILLY TAR AND CHEMI	INDIA	
2.16E+00	28	5.97E+01	4.95E-04	1.80E-05	5.37E-05	92,800	1.40E+03	0.0002	6,000.	145	LION OIL	EL DO	
2.10E+00	6	1.28E+01	1.07E-04	1.74E-05	8.94E-05	2,090,000	1.45E+03	0.0002	5,800.	185	CLARK OIL & REF.	HARTF	
2.08E+00	14	2.98E+01	2.48E-04	1.72E-05	3.34E-05	921,000	1.44E+03	0.0002	5,800.	297	AMOCO OIL REFINERY	SALT	
2.04E+00	1	1.09E+00	9.05E-06	1.70E-05	3.63E-05	110,000	1.54E+02	<0.0001	55,000.	200	TOTAL PETROLEUM	ARKAN	
2.01E+00	2	3.35E+00	2.78E-05	1.67E-05	5.00E-05	1,630,000	1.56E+03	0.0002	5,400.	177	COLORADO REF.	COMME	
1.98E+00	2	3.04E+00	2.53E-05	1.64E-05	8.55E-05	971,000	5.15E+02	0.0001	16,000.	303	AMOCO OIL REFINERY	YORKT	
1.95E+00	7	1.34E+01	1.11E-04	1.62E-05	1.27E-04	434,000	1.23E+03	0.0001	6,900.	135	LOUISIANA LAND & EXP	SARAL	
1.92E+00	<1	4.35E-01	3.61E-06	1.59E-05	3.67E-05	428,000	2.90E+02	<0.0001	29,000.	30	VULCAN MATERIALS	WICH	
1.90E+00	1	1.56E+00	1.29E-05	1.58E-05	5.45E-05	158,000	1.63E+02	<0.0001	52,000.	101	CAIN CHEMICAL	BRAZO	
1.87E+00	2	4.08E+00	3.38E-05	1.55E-05	5.04E-05	555,000	6.52E+02	0.0001	13,000.	216	PLACID REFINING	PORT	
1.80E+00	<1	1.34E-01	1.11E-06	1.50E-05	5.23E-05	154,000	7.00E+01	<0.0001	120,000.	225	AMERADA HESS	PURVI	
1.80E+00	48	8.70E+01	7.22E-04	1.49E-05	8.16E-05	2,760,000	2.92E+03	0.0003	2,900.	153	EXXON	BENIC	
1.77E+00	1	1.14E+00	9.47E-06	1.47E-05	1.49E-05	102,000	8.65E+01	<0.0001	97,000.	126	WITCO CHEMICAL CORPO	POINT	
1.72E+00	16	2.71E+01	2.25E-04	1.43E-05	2.20E-05	111,000	1.08E+03	0.0001	7,800.	231	CONOCO REFINERY	BILLI	
1.69E+00	30	5.09E+01	4.22E-04	1.40E-05	2.87E-05	8,170,000	4.73E+03	0.0006	1,800.	154	FLETCHER OIL & REFIN	WILMI	
1.66E+00	<1	9.06E-02	7.52E-07	1.38E-05	2.92E-05	75,300	5.66E+02	0.0001	15,000.	316	LITTLE AMERICA REF.	CASPE	
1.66E+00	<1	2.92E-02	2.43E-07	1.38E-05	4.31E-05	763,000	2.73E+02	<0.0001	31,000.	182	CHEVRON	HONOL	
1.61E+00	12	1.92E+01	1.59E-04	1.34E-05	1.99E-05	11,600,000	5.06E+03	0.0006	1,700.	236	CHEVRON	PERTH	
1.60E+00	12	1.84E+01	1.53E-04	1.32E-05	5.04E-05	78,500	5.83E+02	0.0001	14,000.	245	AMOCO	MANDA	
1.57E+00	4	6.76E+00	5.61E-05	1.31E-05	2.90E-05	10,500,000	3.46E+03	0.0004	2,400.	64	INT'L FLAVORS & FRAG	UNION	
1.57E+00	<1	6.69E-01	5.55E-06	1.30E-05	5.68E-05	204,000	3.78E+02	<0.0001	22,000.	291	SHELL OIL REFINERY	ODESS	
1.54E+00	3	4.35E+00	3.61E-05	1.28E-05	2.54E-05	115,000	2.19E+02	<0.0001	38,000.	230	CENEX REF.	LAURE	
1.51E+00	<1	2.97E-01	2.47E-06	1.25E-05	1.88E-05	108,000	2.91E+02	<0.0001	29,000.	232	EXXON	BILLI	
1.49E+00	2	3.14E+00	2.61E-05	1.24E-05	1.20E-04	1,220,000	2.35E+03	0.0003	3,600.	246	ASHLAND OIL	CANTO	
1.41E+00	<1	1.38E-01	1.14E-06	1.17E-05	2.55E-05	924,000	3.24E+02	<0.0001	26,000.	302	PHILLIPS 66	WOODS	
1.38E+00	2	2.93E+00	2.44E-05	1.14E-05	7.91E-05	1,160,000	8.01E+02	0.0001	11,000.	193	ROCK ISLAND REFINING	INDIA	
1.37E+00	3	3.71E+00	3.08E-05	1.13E-05	1.10E-05	859,000	5.02E+02	0.0001	17,000.	77	GENERAL ELECTRIC	WATER	
1.32E+00	13	1.77E+01	1.47E-04	1.10E-05	2.51E-05	2,590,000	2.16E+03	0.0003	3,900.	341	LTV STEEL	CLEVE	

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TABLE D-3. (continued)

Summary for BENZENE REFINERIES
with a Unit Risk of 8.30E-06

SIC= CAS=

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- M a x i m u m -					- M i n i m u m -					Annual Repeat		S o u r c e
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Incidence	Interval			
1.29E+00	2	2.82E+00	2.34E-05	1.07E-05	7.64E-06	358,000	2.14E+02	<0.0001	39,000.	296	VALERO ENERGY CORP.	CORPU
1.26E+00	42	5.22E+01	4.33E-04	1.04E-05	4.81E-05	2,310,000	3.48E+03	0.0004	2,400.	343	LTV STEEL COMPANY	PITTS
1.23E+00	1	1.28E+00	1.06E-05	1.02E-05	4.27E-05	415,000	1.56E+02	<0.0001	54,000.	80	ARIS TECH CHEMICAL	HAVER
1.21E+00	14	1.74E+01	1.44E-04	1.00E-05	1.94E-05	921,000	8.40E+02	0.0001	10,000.	298	BIG WEST OIL	SALT
1.19E+00	16	1.92E+01	1.60E-04	9.86E-06	2.19E-05	463,000	1.32E+03	0.0002	6,400.	195	DERBY REFINING COMPA	WICHI
1.19E+00	<1	3.01E-01	2.49E-06	9.84E-06	1.73E-05	69,300	4.07E+02	<0.0001	21,000.	315	FRONTIER OIL	CHEYE
1.18E+00	1	9.78E-01	8.12E-06	9.83E-06	2.00E-05	725,000	3.29E+02	<0.0001	26,000.	348	U.S. STEEL CORP.	PROVO
1.18E+00	36	4.25E+01	3.52E-04	9.79E-06	1.77E-05	8,630,000	4.55E+03	0.0005	1,900.	152	EDGINGTON OIL COMPAN	LONG
1.13E+00	<1	2.87E-02	2.38E-07	9.41E-06	4.00E-05	5,490,000	1.07E+03	0.0001	7,800.	330	INLAND STEEL	E CHI
1.13E+00	17	1.94E+01	1.61E-04	9.36E-06	2.06E-05	2,790,000	4.29E+03	0.0005	2,000.	44	FMC CORP.	BALTI
1.12E+00	44	4.88E+01	4.05E-04	9.30E-06	2.77E-04	8,180,000	3.95E+04	0.0047	210.	147	ATLANTIC RICHFIELD	CARSO
1.08E+00	8	8.29E+00	6.88E-05	8.97E-06	9.23E-06	837,000	5.82E+02	0.0001	14,000.	244	CIBRO PETROLEUM	ALBAN
1.06E+00	1	9.22E-01	7.66E-06	8.80E-06	1.93E-05	207,000	7.42E+01	<0.0001	110,000.	260	PENNZOIL COMPANY	ROUSE
1.05E+00	28	2.97E+01	2.47E-04	8.70E-06	2.79E-05	1,160,000	1.66E+03	0.0002	5,100.	342	BETHLEHEM STEEL CORP	BETHL
1.03E+00	71	7.32E+01	6.08E-04	8.58E-06	1.26E-05	131,000	5.22E+02	0.0001	16,000.	289	PRIDE REFINING	ABILE
1.02E+00	2	2.18E+00	1.81E-05	8.50E-06	2.47E-05	196,000	2.49E+02	<0.0001	34,000.	313	MURPHY OIL CORPORATI	SUPER
1.02E+00	13	1.37E+01	1.14E-04	8.48E-06	1.07E-06	1,060,000	6.15E+02	0.0001	14,000.	280	HOWELL HYDROCARBONS	SAN A
1.02E+00	22	2.23E+01	1.85E-04	8.44E-06	3.55E-05	2,190,000	1.20E+03	0.0001	7,000.	338	ARMCO INC	MIDDL
1.01E+00	2	2.17E+00	1.80E-05	8.35E-06	9.24E-06	335,000	3.31E+02	<0.0001	25,000.	323	GULF STATES	GADSD
9.86E-01	35	3.45E+01	2.86E-04	8.18E-06	8.34E-05	2,910,000	4.49E+03	0.0005	1,900.	173	TOSCO CORP.	MARTI
9.51E-01	13	1.24E+01	1.03E-04	7.89E-06	1.93E-05	2,690,000	1.03E+03	0.0001	8,200.	359	ERIEWAY POLL. CONTRO	BEDFO
8.68E-01	1	7.17E-01	5.95E-06	7.20E-06	4.47E-05	1,030,000	5.49E+02	0.0001	15,000.	349	WHEELING PITT	E STE
8.60E-01	2	1.83E+00	1.52E-05	7.14E-06	2.66E-05	4,560,000	9.87E+02	0.0001	8,500.	57	ATLANTIC WOOD INDUST	HAINE
8.55E-01	4,530	3.88E+03	3.22E-02	7.10E-06	6.83E-04	2,380,000	2.40E+04	0.0028	350.	97	AMERICAN HOECHST COR	PASAD
8.50E-01	2	1.48E+00	1.23E-05	7.05E-06	1.30E-05	61,000	5.15E+01	<0.0001	160,000.	241	BLOOMFIELD REFINING	BLOOM
8.47E-01	35	2.96E+01	2.46E-04	7.03E-06	7.17E-05	2,910,000	3.85E+03	0.0005	2,200.	168	SHELL OIL	MARTI
8.43E-01	<1	2.03E-02	1.69E-07	6.99E-06	1.56E-05	379,000	8.48E+01	<0.0001	99,000.	194	DERBY REF.	EL DO
7.74E-01	3	2.01E+00	1.67E-05	6.43E-06	9.29E-06	810,000	5.51E+02	0.0001	15,000.	320	ABC COKE	TARRA
7.63E-01	1	7.43E-01	6.17E-06	6.33E-06	1.33E-05	300,000	7.48E+01	<0.0001	110,000.	380	IT CORP.-PETROL. WAS	BUTTO
7.58E-01	37	2.82E+01	2.34E-04	6.29E-06	2.73E-05	1,190,000	2.07E+03	0.0002	4,100.	369	ECOLTEC	DAYTO
7.44E-01	1	8.30E-01	6.89E-06	6.18E-06	1.62E-05	248,000	3.85E+01	<0.0001	1220,000.	211	HILL PETROLEUM	ST. R
7.44E-01	10	7.64E+00	6.34E-05	6.18E-06	1.70E-05	4,530,000	6.37E+02	0.0001	13,000.	162	NEWHALL REFINING CO.	NEWHA
7.32E-01	1	4.35E-01	3.61E-06	6.08E-06	4.52E-05	495,000	1.12E+03	0.0001	7,500.	274	EL PASO REFINING	EL PA
7.07E-01	2	1.11E+00	9.19E-06	5.87E-06	2.01E-05	2,110,000	3.61E+02	<0.0001	23,000.	398	DELAWARE CONTAINERS	COATS
6.79E-01	14	9.24E+00	7.67E-05	5.64E-06	1.08E-05	12,200,000	2.34E+03	0.0003	3,600.	235	AMERADA-HESS	PORT
6.63E-01	<1	2.58E-01	2.14E-06	5.50E-06	2.12E-05	551,000	9.56E+01	<0.0001	88,000.	36	DOW CHEMICAL	PLAQU
6.55E-01	46	3.00E+01	2.49E-04	5.44E-06	4.32E-06	338,000	6.44E+02	0.0001	13,000.	294	TRIPINERY	CORPU
6.42E-01	265	1.70E+02	1.41E-03	5.33E-06	9.40E-05	8,730,000	1.32E+04	0.0016	640.	156	GOLDEN WEST REFINING	SANTA
6.36E-01	<1	2.26E-01	1.87E-06	5.28E-06	1.03E-05	929,000	2.80E+02	<0.0001	30,000.	300	CRYSEN REFINING	WOODS
6.33E-01	<1	2.10E-01	1.75E-06	5.25E-06	1.92E-05	790,000	3.67E+02	<0.0001	23,000.	322	KOPPERS	WOODW
6.10E-01	6	3.83E+00	3.18E-05	5.07E-06	1.22E-05	325,000	6.83E+02	0.0001	12,000.	159	KERN OIL & REFINING	BAKER
5.93E-01	7	4.34E+00	3.60E-05	4.92E-06	7.82E-04	349,000	3.14E+03	0.0004	2,700.	269	CHEVRON	PORT
5.79E-01	1	3.49E-01	2.90E-06	4.81E-06	2.49E-05	4,490,000	6.59E+02	0.0001	13,000.	239	MANTUA OIL	THORO
5.58E-01	<1	4.58E-02	3.80E-07	4.63E-06	3.29E-05	326,000	1.37E+02	<0.0001	62,000.	191	INDIANA FARM BUREAU	MT. V
5.40E-01	<1	9.41E-02	7.81E-07	4.48E-06	6.90E-06	1,760,000	2.14E+02	<0.0001	39,000.	308	SOUND REF.	TACOM

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TABLE D-3. (continued)

Summary for BENZENE
with a Unit Risk of 8.30E-06

SIC= CAS=

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- M a x i m u m -					- - M i n i m u m - -					Annual Repeat		S o u r c e
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Incidence	Interval			
5.12E-01	265	1.36E+02	1.13E-03	4.25E-06	7.49E-05	8,730,000	1.05E+04	0.0012	800.	166	POWERINE OIL	SANTA
5.01E-01	44	2.22E+01	1.84E-04	4.16E-06	3.31E-05	424,000	4.76E+02	0.0001	18,000.	332	ARNCO INC.	ASHLA
5.00E-01	4	1.89E+00	1.57E-05	4.15E-06	1.08E-05	197,000	8.03E+01	<0.0001	110,000.	259	WITCO CHEMICAL CORP.	BRADF
5.00E-01	705	3.52E+02	2.92E-03	4.15E-06	6.35E-04	2,210,000	1.36E+04	0.0016	620.	275	EXXON CORP	BAYTO
4.74E-01	<1	1.32E-02	1.09E-07	3.94E-06	7.94E-06	925,000	2.04E+02	<0.0001	41,000.	393	PETROCHEM RECYCLING	SALT
4.30E-01	<1	1.74E-02	1.44E-07	3.57E-06	1.88E-05	279,000	1.52E+02	<0.0001	56,000.	180	AMOCO	SAVAN
4.18E-01	13	5.43E+00	4.51E-05	3.47E-06	4.30E-05	2,580,000	6.35E+02	0.0001	13,000.	78	NEPERA CHEMICAL CO.,	HARRI
4.08E-01	71	2.88E+01	2.39E-04	3.39E-06	6.36E-06	8,200,000	1.40E+03	0.0002	6,000.	148	CHEMOIL	SIGNA
4.08E-01	<1	3.18E-02	2.64E-07	3.38E-06	1.64E-05	3,430,000	4.07E+02	<0.0001	21,000.	62	DUPONT	DEEPW
3.97E-01	<1	9.02E-02	7.49E-07	3.29E-06	7.53E-06	30,900	6.22E+00	<0.0001	*****	301	PENNZOIL	ROOSE
3.92E-01	1	4.76E-01	3.95E-06	3.25E-06	7.64E-06	325,000	2.17E+02	<0.0001	39,000.	170	SUNLAND REF.	BAKER
3.87E-01	<1	1.11E-01	9.23E-07	3.21E-06	1.39E-05	6,100,000	7.95E+02	0.0001	11,000.	368	CHEM. WASTE MGMT.	CALUM
3.73E-01	4	1.32E+00	1.10E-05	3.10E-06	1.73E-05	3,810,000	5.67E+02	0.0001	15,000.	350	DETROIT COKE	DETRI
3.67E-01	6	2.27E+00	1.89E-05	3.05E-06	1.31E-05	6,100,000	8.21E+02	0.0001	10,000.	327	LTV STEEL	S CHI
3.62E-01	20	7.31E+00	6.07E-05	3.01E-06	1.22E-05	807,000	5.01E+02	0.0001	17,000.	324	SLOSS INDUSTRIES	BIRMI
3.60E-01	1	5.05E-01	4.19E-06	2.98E-06	1.84E-05	927,000	1.47E+02	<0.0001	57,000.	312	QUAKER STATE OIL REF	NEWEL
3.59E-01	54	1.95E+01	1.61E-04	2.98E-06	1.28E-05	6,210,000	1.31E+03	0.0002	6,400.	326	ACME STEEL	CHICA
3.58E-01	16	5.57E+00	4.62E-05	2.97E-06	6.58E-05	287,000	3.18E+02	<0.0001	27,000.	223	TOTAL PETROLEUM	ALMA
3.54E-01	17	6.13E+00	5.09E-05	2.94E-06	1.53E-05	2,180,000	5.37E+02	0.0001	16,000.	325	NATIONAL STEEL	GRANI
3.52E-01	49	1.72E+01	1.43E-04	2.92E-06	1.29E-05	1,670,000	9.11E+02	0.0001	9,300.	383	CECOS INT'L	CINCI
3.32E-01	<1	1.56E-01	1.29E-06	2.76E-06	1.51E-05	1,000,000	2.15E+02	<0.0001	39,000.	337	LTV STEEL	WARRE
3.30E-01	9	2.94E+00	2.44E-05	2.74E-06	4.84E-06	1,240,000	1.96E+02	<0.0001	43,000.	335	TONAWANDA	TONAW
3.27E-01	2	5.06E-01	4.20E-06	2.71E-06	1.17E-05	4,400,000	2.88E+02	<0.0001	29,000.	331	U.S. STEEL CORP.	GARY
3.24E-01	16	5.24E+00	4.35E-05	2.69E-06	2.27E-06	1,230,000	8.58E+01	<0.0001	98,000.	4	ALPHA RESINS	FERRI
3.16E-01	1	3.83E-01	3.18E-06	2.62E-06	6.15E-06	325,000	1.74E+02	<0.0001	48,000.	167	SAN JOAQUIN REF.	BAKER
3.14E-01	<1	1.27E-01	1.05E-06	2.60E-06	6.04E-06	126,000	1.04E+01	<0.0001	180,000.	229	SOUTHLAND OIL	SANDE
3.10E-01	<1	6.78E-02	5.63E-07	2.57E-06	6.70E-05	924,000	1.91E+03	0.0002	4,400.	265	MAPCO PETROLEUM	MEMPH
3.08E-01	54	1.65E+01	1.37E-04	2.56E-06	8.41E-06	562,000	3.75E+02	<0.0001	22,000.	334	NATIONAL STEEL GROUP	ECORS
3.07E-01	65	2.00E+01	1.66E-04	2.55E-06	5.23E-06	1,310,000	7.88E+02	0.0001	11,000.	256	CHEVRON	PORTL
3.05E-01	1	4.25E-01	3.53E-06	2.53E-06	1.05E-05	297,000	9.69E+01	<0.0001	87,000.	339	NEW BOSTON COKE	PORTS
3.00E-01	15	4.47E+00	3.71E-05	2.49E-06	1.54E-05	2,410,000	8.28E+02	0.0001	10,000.	345	SHENANGO	SHENA
2.91E-01	3	7.77E-01	6.45E-06	2.41E-06	1.74E-05	9,580	3.31E+01	<0.0001	1250,000.	318	WYOMING REF.	NEWCA
2.78E-01	3	7.48E-01	6.21E-06	2.31E-06	1.50E-05	1,190,000	6.27E+02	0.0001	13,000.	329	CITIZENS GAS	INDIA
2.78E-01	1	1.85E-01	1.54E-06	2.31E-06	1.13E-05	110,000	1.52E+02	<0.0001	56,000.	227	ERGON REF.	VICKS
2.69E-01	2	4.07E-01	3.38E-06	2.23E-06	3.91E-05	935,000	7.64E+02	0.0001	11,000.	299	CHEVRON	SALT
2.68E-01	<1	2.29E-02	1.90E-07	2.22E-06	7.49E-06	574,000	3.42E+01	<0.0001	1250,000.	39	RUBICON CHEMICALS IN	GEISM
2.59E-01	<1	5.83E-02	4.84E-07	2.15E-06	1.15E-04	626,000	1.97E+03	0.0002	4,300.	254	SUN REFINING	TULSA
2.56E-01	<1	3.86E-03	3.20E-08	2.12E-06	1.02E-05	4,450,000	4.11E+02	<0.0001	21,000.	67	MONSANTO CO	BRIDG
2.50E-01	<1	2.66E-02	2.21E-07	2.07E-06	2.43E-04	4,870,000	2.41E+04	0.0029	350.	258	CHEVRON	PHILA
2.46E-01	50	1.22E+01	1.01E-04	2.05E-06	5.10E-06	83,000	2.97E+02	<0.0001	28,000.	233	MONTANA REFINING COM	GREAT
2.45E-01	10	2.48E+00	2.06E-05	2.03E-06	1.26E-05	2,070,000	2.17E+02	<0.0001	39,000.	87	ATLANTIC RICHFIELD C	MONAC
2.45E-01	3	8.41E-01	6.98E-06	2.03E-06	1.19E-05	234,000	3.51E+01	<0.0001	1240,000.	311	MIDATLANTIC REF.	ST. M
2.34E-01	28	6.50E+00	5.39E-05	1.94E-06	2.41E-04	455,000	8.60E+02	0.0001	9,800.	74	MONTROSE CHEMICAL CO	HENDE
2.33E-01	1	2.31E-01	1.92E-06	1.94E-06	8.18E-06	209,000	2.59E+01	<0.0001	1330,000.	151	CONOCO	SANTA
2.32E-01	1	1.55E-01	1.29E-06	1.92E-06	7.28E-06	511,000	9.04E+01	<0.0001	93,000.	46	DOW CORNING	MIDLA

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TABLE D-3. (continued)

Summary for BENZENE
with a Unit Risk of 8.30E-06

SIC= CAS=

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- M a x i m u m -					- - M i n i m u m - -					Annual Repeat		S o u r c e	
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Incidence	Interval				
2.26E-01	1	1.33E-01	1.10E-06	1.88E-06	6.22E-06	278,000	9.36E+00	<0.0001	900,000.	20	GOODRICH, (B.F.)	HENRY	
2.07E-01	12	2.55E+00	2.12E-05	1.72E-06	7.76E-06	2,110,000	1.89E+02	<0.0001	45,000.	347	SHARON STEEL	MONES	
1.99E-01	2	4.11E-01	3.41E-06	1.65E-06	6.12E-06	225,000	5.59E+01	<0.0001	150,000.	204	CALCASIEU REFINING	LAKE	
1.89E-01	723	1.36E+02	1.13E-03	1.57E-06	1.25E-04	92,400	1.13E+03	0.0001	7,500.	251	CONOCO	PONCA	
1.86E-01	6	1.13E+00	9.35E-06	1.54E-06	3.32E-06	327,000	1.67E+02	<0.0001	51,000.	155	WITCO CORP.	OILDA	
1.84E-01	1	1.04E-01	8.65E-07	1.53E-06	8.26E-06	1,150,000	1.43E+02	<0.0001	59,000.	129	ATLANTIC WOOD INDUST	PORTS	
1.81E-01	40	7.24E+00	6.01E-05	1.50E-06	5.33E-06	8,530,000	8.58E+02	0.0001	9,800.	160	LUNDAY-THAGARD CO.	SOUTH	
1.76E-01	1	1.96E-01	1.63E-06	1.46E-06	3.84E-06	248,000	9.11E+00	<0.0001	930,000.	212	KERR-MCGEE REFINING	COTTO	
1.72E-01	<1	4.64E-03	3.85E-08	1.43E-06	3.64E-06	230,000	5.18E+00	<0.0001	*****	146	ANCHOR REF.	MCKIT	
1.65E-01	2	3.31E-01	2.75E-06	1.37E-06	7.52E-06	166,000	3.02E+01	<0.0001	280,000.	202	SOMERSET REFINERY	SOMER	
1.56E-01	111	1.73E+01	1.43E-04	1.29E-06	2.52E-06	8,090,000	5.21E+02	0.0001	16,000.	158	HUNTWAY REF.	WILMI	
1.52E-01	4	6.06E-01	5.03E-06	1.26E-06	1.57E-06	2,090,000	1.52E+02	<0.0001	55,000.	305	CHEVRON	SEATT	
1.47E-01	2	2.93E-01	2.43E-06	1.22E-06	4.16E-06	168,000	9.37E+00	<0.0001	900,000.	228	SOUTHLAND OIL	LUMBE	
1.37E-01	1	1.21E-01	1.00E-06	1.14E-06	3.96E-06	97,800	8.26E+00	<0.0001	*****	144	CROSS OIL & REFINING	SMACK	
1.34E-01	<1	2.20E-02	1.83E-07	1.11E-06	8.58E-06	168,000	5.89E+00	<0.0001	*****	12	OLIN CORP.	ST. M	
1.32E-01	12	1.53E+00	1.27E-05	1.09E-06	2.32E-06	1,690,000	8.31E+01	<0.0001	1100,000.	181	YOUNG REF.	DOUGL	
1.21E-01	3	3.95E-01	3.28E-06	1.00E-06	2.66E-06	834,000	3.33E+01	<0.0001	250,000.	11	ALPHA CHEMICAL	LAKEL	
1.20E-01	7	7.79E-01	6.46E-06	9.93E-07	4.84E-06	506,000	1.74E+02	<0.0001	48,000.	221	LAKEVIEW REF.	KALAM	
1.18E-01	<1	8.13E-04	6.75E-09	9.79E-07	2.49E-06	144,000	2.58E+00	<0.0001	*****	283	LIQUID ENERGY CORP.	BRIDG	
1.16E-01	17	2.00E+00	1.66E-05	9.59E-07	6.01E-06	2,390,000	2.41E+02	<0.0001	35,000.	88	CALGON CARBON	NEVIL	
1.15E-01	22	2.56E+00	2.12E-05	9.55E-07	3.07E-06	93,500	3.09E+01	<0.0001	270,000.	353	ENSCO	EL DO	
1.15E-01	35	4.00E+00	3.32E-05	9.52E-07	2.03E-06	2,540,000	1.76E+02	<0.0001	48,000.	116	HEAT ENERGY TECH.	DALLA	
1.15E-01	163	1.87E+01	1.55E-04	9.51E-07	5.97E-05	2,640,000	2.33E+03	0.0003	3,600.	112	GEORGIA-PACIFIC CORP	PASAD	
1.13E-01	24	2.66E+00	2.20E-05	9.35E-07	2.59E-05	2,440,000	5.64E+02	0.0001	15,000.	333	BETHLEHEM STEEL CORP	SPARR	
1.06E-01	40	4.22E+00	3.50E-05	8.79E-07	2.79E-06	609,000	1.67E+02	<0.0001	51,000.	163	OXNARD REF.	OXNAR	
1.00E-01	9	9.43E-01	7.82E-06	8.30E-07	4.49E-06	831,000	1.34E+02	<0.0001	63,000.	340	TOLEDO COKE	TOLED	
9.67E-02	2	2.40E-01	1.99E-06	8.03E-07	4.18E-06	4,790,000	1.96E+02	<0.0001	43,000.	61	DUPONT	GIBBS	
9.44E-02	1	5.46E-02	4.54E-07	7.83E-07	3.01E-06	42,300	2.50E+00	<0.0001	*****	104	COSDEN OIL & CHEMICA	BIG S	
9.25E-02	1	8.83E-02	7.33E-07	7.68E-07	2.32E-06	389,000	7.81E+00	<0.0001	*****	205	CALUMET REFINING COM	PRINC	
9.08E-02	1	6.45E-02	5.35E-07	7.54E-07	4.65E-06	292,000	1.00E+01	<0.0001	1840,000.	192	LAKETON REFINING	LAKET	
8.85E-02	6	5.27E-01	4.38E-06	7.34E-07	2.43E-06	297,000	2.25E+01	<0.0001	370,000.	53	REICHOLD CHEMICALS	GULFP	
8.33E-02	28	2.33E+00	1.93E-05	6.91E-07	2.90E-06	2,340,000	1.90E+02	<0.0001	44,000.	89	KOPPERS CO INC	BRIDG	
8.19E-02	<1	1.82E-02	1.51E-07	6.80E-07	2.72E-06	103,000	1.98E+00	<0.0001	*****	372	ROGERS LANDFILL	CENTR	
7.21E-02	106	7.65E+00	6.35E-05	5.98E-07	2.39E-05	1,270,000	1.05E+03	0.0001	8,000.	336	BETHLEHEM STEEL	LACKA	
6.84E-02	1	7.43E-02	6.17E-07	5.68E-07	3.81E-06	372,000	2.25E+01	<0.0001	380,000.	16	NIPRO, INC.	AUGUS	
6.69E-02	163	1.09E+01	9.06E-05	5.55E-07	3.49E-05	2,640,000	1.36E+03	0.0002	6,200.	111	GEORGIA GULF CORP.	PASAD	
6.16E-02	10	6.16E-01	5.11E-06	5.11E-07	7.42E-07	13,300,000	4.29E+02	0.0001	20,000.	73	TROY CHEMICAL CORP.,	NEWAR	
5.83E-02	38	2.22E+00	1.84E-05	4.84E-07	1.30E-06	2,600,000	9.69E+01	<0.0001	87,000.	122	S.D.S. BIOTECH CORP.	HOUST	
5.47E-02	1	3.86E-02	3.20E-07	4.54E-07	1.85E-06	253,000	4.01E+00	<0.0001	*****	220	CRYSTAL REF.	CARSO	
5.09E-02	21	1.05E+00	8.71E-06	4.23E-07	8.02E-07	12,500,000	2.33E+02	<0.0001	36,000.	66	MOBAY CORP.	HALED	
5.01E-02	70	3.52E+00	2.92E-05	4.16E-07	7.01E-07	12,900,000	3.16E+02	<0.0001	27,000.	70	REICHOLD CHEMICALS	ELIZA	
4.82E-02	<1	2.69E-03	3.24E-08	4.00E-07	4.71E-07	2,520,000	9.26E+00	<0.0001	910,000.	377	IT CORPORATION	BENEC	
4.77E-02	48	2.31E+00	1.91E-05	3.96E-07	2.16E-06	2,760,000	7.75E+01	<0.0001	110,000.	157	HUNTWAY REF.	BENEC	
4.14E-02	<1	1.85E-03	1.53E-07	3.44E-07	2.41E-07	364,000	4.96E+00	<0.0001	*****	117	KOCH INDUSTRIES	CORPU	
4.11E-02	1	2.07E-02	1.72E-07	3.41E-07	1.25E-06	223,000	1.21E+01	<0.0001	690,000.	42	VISTA CHEMICAL	WESTL	

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TABLE D-3. (continued)

Summary for BENZENE
with a Unit Risk of 8.30E-06

SIC= CAS=

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- M a x i m u m -					- - M i n i m u m - -					Annual Repeat		S o u r c e
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Incidence	Interval			
4.02E-02	23	9.26E-01	7.68E-06	3.34E-07	2.33E-04	547,000	7.74E+02	0.0001	11,000.	219	STAR REF..	CONVE
3.57E-02	233	8.32E+00	6.91E-05	2.96E-07	7.45E-04	284,000	1.11E+03	0.0001	7,600.	226	CHEVRON	PASCA
3.30E-02	80	2.62E+00	2.18E-05	2.73E-07	6.74E-07	9,100,000	1.31E+02	<0.0001	64,000.	6	LILLY COATINGS	MONTE
3.15E-02	<1	4.20E-03	3.48E-08	2.61E-07	1.06E-06	1,800,000	1.32E+01	<0.0001	1640,000.	48	3-M COMPANY	COTTA
2.59E-02	1	1.49E-02	1.24E-07	2.15E-07	9.35E-07	395,000	6.47E+00	<0.0001	*****	120	MOBIL CHEMICALS	BEAUM
2.52E-02	2	4.13E-02	3.42E-07	2.09E-07	8.64E-07	1,570,000	1.84E+01	<0.0001	1460,000.	82	MONSANTO CO	ADDYS
2.49E-02	2	4.60E-02	3.82E-07	2.07E-07	4.35E-07	3,100,000	4.77E+01	<0.0001	1180,000.	364	CHEM-CLEAR INC.	BALTI
2.44E-02	<1	4.12E-03	3.42E-08	2.03E-07	4.64E-07	2,540,000	3.63E+01	<0.0001	1230,000.	365	CHEM-CLEAR INC.	CLEVE
2.39E-02	8	1.86E-01	1.54E-06	1.99E-07	3.46E-07	2,060,000	1.97E+01	<0.0001	1430,000.	9	UPJOHN CO.,THE	NORTH
2.35E-02	<1	2.85E-03	2.37E-08	1.95E-07	1.94E-07	309,000	1.57E+00	<0.0001	*****	2	MONSANTO CO	ANNIS
1.87E-02	<1	4.23E-03	3.51E-08	1.55E-07	3.40E-07	425,000	2.35E+00	<0.0001	*****	29	AIR PRODUCTS & CHEM.	WICHI
1.81E-02	20	3.66E-01	3.04E-06	1.50E-07	4.52E-06	333,000	7.30E+01	<0.0001	1120,000.	344	ERIE COKE	ERIE
1.74E-02	10	1.66E-01	1.38E-06	1.45E-07	1.03E-05	2,690,000	5.06E+02	0.0001	17,000.	100	ATLANTIC RICHFIELD	HOUST
1.70E-02	17	2.96E-01	2.46E-06	1.41E-07	9.45E-07	1,150,000	2.29E+01	<0.0001	1370,000.	376	HERITAGE ENV. SERVIC	INDIA
1.49E-02	7	1.02E-01	8.43E-07	1.24E-07	4.73E-07	2,680,000	2.54E+01	<0.0001	1330,000.	118	KOPPERS	HOUST
1.45E-02	10	1.38E-01	1.14E-06	1.20E-07	6.78E-07	4,250,000	4.13E+01	<0.0001	1200,000.	366	CHEM-MET SERVICES	WYAND
1.24E-02	54	6.73E-01	5.59E-06	1.03E-07	1.70E-07	1,940,000	1.83E+01	<0.0001	1460,000.	382	CECOS INT'L	BRIST
1.15E-02	230	2.64E+00	2.19E-05	9.54E-08	3.76E-05	2,360,000	2.95E+02	<0.0001	29,000.	328	BETHLEHEM STEEL	BURNS
9.76E-03	360	3.51E+00	2.92E-05	8.10E-08	7.21E-05	76,500	5.11E+01	<0.0001	1170,000.	139	MAPCO PETROLEUM	NORTH
9.58E-03	<1	2.19E-05	1.81E-10	7.95E-08	3.32E-07	1,260,000	1.80E+00	<0.0001	*****	41	UNION CARBIDE CORP.	HAHNV
9.31E-03	497	4.62E+00	3.84E-05	7.73E-08	4.39E-06	189,000	4.16E+01	<0.0001	1200,000.	321	EMPIRE COKE COMPANY	TUSCA
9.10E-03	<1	2.61E-03	2.17E-08	7.55E-08	3.26E-07	6,100,000	1.87E+01	<0.0001	1450,000.	363	CID-LANDFILL	CALUM
9.08E-03	<1	2.49E-03	2.07E-08	7.54E-08	2.65E-07	1,730,000	1.49E+00	<0.0001	*****	23	REILLY TAR AND CHEM	GRANI
8.85E-03	<1	4.30E-04	3.57E-09	7.34E-08	1.56E-07	2,240,000	4.77E+00	<0.0001	*****	115	GOODYEAR TIRE & RUBB	LAPOR
7.53E-03	<1	1.70E-03	1.41E-08	6.25E-08	1.37E-07	425,000	9.45E-01	<0.0001	*****	28	ABBOTT LABORATORIES	WICHI
7.21E-03	28	2.00E-01	1.66E-06	5.99E-08	1.02E-07	1,170,000	7.93E+00	<0.0001	*****	370	FRONTIER CHEMICAL	NIAGR
6.79E-03	387	2.63E+00	2.18E-05	5.64E-08	1.22E-04	27,100	3.34E+01	<0.0001	1250,000.	272	DIAMOND SHAMROCK	SUNRA
5.98E-03	7	3.92E-02	3.25E-07	4.96E-08	1.88E-07	708,000	3.17E+00	<0.0001	*****	99	AMOCO CHEMICAL	TEXAS
5.66E-03	525	2.97E+00	2.47E-05	4.70E-08	2.51E-05	406,000	2.61E+02	<0.0001	32,000.	134	HUNT REFINING	TUSCA
5.59E-03	1	5.85E-03	1.85E-08	4.64E-08	2.44E-07	189,000	4.90E-01	<0.0001	*****	33	GAF CORP.	CALVE
4.44E-03	1	4.59E-02	3.81E-08	3.68E-08	1.54E-07	415,000	5.59E-01	<0.0001	*****	85	USS CHEMICAL	IRONT
4.23E-03	1	2.78E-03	2.30E-08	3.51E-08	2.48E-07	649,000	1.12E+00	<0.0001	*****	54	MALLINCKRODT CHEM.	RALEI
3.65E-03	1	4.97E-03	4.12E-08	3.03E-08	2.25E-08	328,000	3.23E-01	<0.0001	*****	102	CELANESE CHEMICAL	BISHO
3.64E-03	2	7.64E-03	6.34E-08	3.02E-08	7.00E-08	1,970,000	2.02E+00	<0.0001	*****	81	BF GOODRICH	AVON
3.63E-03	<1	1.83E-04	1.52E-09	3.02E-08	9.81E-08	469,000	4.56E-01	<0.0001	*****	18	NORCHEM CO.	CLINT
3.39E-03	175	5.94E-01	4.93E-06	2.82E-08	2.39E-05	60,000	3.56E+01	<0.0001	1240,000.	242	GIANT REFINERY	GALLU
3.37E-03	15	4.98E-02	4.13E-07	2.80E-08	9.20E-08	804,000	4.07E+00	<0.0001	*****	1	ALLIED SIGNAL	BIRMI
2.62E-03	50	1.31E-01	1.09E-06	2.18E-08	7.31E-05	354,000	1.34E+02	<0.0001	63,000.	210	HILL PETROLEUM	KROTZ
2.51E-03	1	1.70E-03	1.41E-08	2.08E-08	2.70E-08	2,000,000	6.21E-01	<0.0001	*****	5	DOW CHEMICAL	PITTS
2.25E-03	57	1.29E-01	1.07E-06	1.87E-08	2.31E-06	824,000	2.22E+01	<0.0001	1380,000.	128	HERCULES	MAGNA
2.24E-03	77	1.73E-01	1.43E-06	1.86E-08	7.51E-07	2,210,000	3.85E+01	<0.0001	1220,000.	50	MONSANTO CO	ST. L
2.07E-03	4	8.25E-02	6.85E-08	1.71E-08	2.13E-08	2,090,000	2.07E+00	<0.0001	*****	361	CHEMICAL PROCESSORS	SEATT
2.00E-03	109	2.19E-01	1.81E-06	1.66E-08	2.67E-05	25,100	5.34E+00	<0.0001	*****	197	FARMLAND FACILITIES	PHILL
1.61E-03	1	1.02E-02	8.49E-09	1.33E-08	4.66E-08	113,000	8.00E-02	<0.0001	*****	3	GREAT LAKES CHEMICAL	EL DO
1.31E-03	345	1.10E-01	9.17E-06	1.08E-08	7.20E-06	158,000	1.12E+01	<0.0001	1750,000.	261	QUAKER STATE OIL REF	SMETH

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TABLE D-3. (continued)

Summary for BENZENE REFINERIES
with a Unit Risk of 8.30E-06

SIC= CAS=

- M a x i m u m -					- - M i n i m u m - -					S o u r c e		
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval			
1.23E-03	22	2.70E-02	2.24E-07	1.02E-08	1.17E-04	34,800	6.89E+00	<0.0001*****		141	TESARO ALASKA PETROL	KENAI
1.20E-03	11	1.30E-02	1.08E-07	9.92E-09	3.24E-08	902,000	2.73E+00	<0.0001*****		76	EASTMAN KODAK	ROCHE
1.07E-03	<1	8.92E-05	7.40E-10	8.89E-09	2.01E-08	200,000	2.16E-02	<0.0001*****		19	CLARK OIL & REFINING	BLUE
1.05E-03	<1	7.49E-05	6.21E-10	8.73E-09	1.82E-08	2,590,000	5.15E-01	<0.0001*****		113	GLIDDEN COATINGS	CARRO
1.01E-03	<1	1.16E-06	9.59E-12	8.35E-09	5.85E-08	362,000	1.71E-01	<0.0001*****		17	OLIN CHEMICALS	AUGUS
8.83E-04	1,150	1.02E+00	8.46E-06	7.33E-09	5.72E-05	34,300	9.50E+00	<0.0001890,000.		243	NAVAJO REFINING	ARTES
7.76E-04	2	1.46E-03	1.21E-08	6.44E-09	2.23E-08	386,000	1.02E-01	<0.0001*****		114	GOODYEAR TIRE	BEAUM
7.53E-04	1	9.66E-04	8.02E-09	6.25E-09	3.91E-08	294,000	7.37E-02	<0.0001*****		25	US INDUSTRIAL CHEM.	TUSCO
7.52E-04	491	3.69E-01	3.07E-06	6.24E-09	9.99E-06	221,000	1.19E+01	<0.0001710,000.		206	CANAL REF.	CHURC
7.13E-04	<1	2.15E-04	1.78E-09	5.91E-09	4.96E-08	12,700,000	1.17E+01	<0.0001720,000.		56	AMERICAN CYANAMID CO	LINDE
6.99E-04	22	1.54E-02	1.28E-07	5.80E-09	4.49E-04	252	1.19E-01	<0.0001*****		391	USPCI GRASSY MT.	KNOWL
6.86E-04	10	6.86E-03	5.70E-08	5.70E-09	8.28E-09	13,300,000	4.79E+00	<0.0001*****		68	ORBIS PRODUCTS CORP	NEWAR
6.63E-04	601	3.99E-01	3.31E-06	5.50E-09	4.31E-06	357,000	9.51E+00	<0.0001890,000.		356	ENV. ENTERPRISES	CINCI
6.19E-04	14	8.42E-03	6.99E-08	5.14E-09	2.23E-08	435,000	6.50E-01	<0.0001*****		79	ALLIED CHEMICAL	IRONT
5.53E-04	4	2.39E-03	1.98E-08	4.59E-09	2.26E-08	483,000	1.47E-01	<0.0001*****		96	US ARMY MUNITIONS	KINGS
5.27E-04	1	3.42E-04	2.84E-09	4.37E-09	1.93E-07	2,450,000	5.39E+00	<0.0001*****		125	UPJOHN CO	LA PO
5.16E-04	360	1.86E-01	1.54E-06	4.28E-09	3.81E-06	76,500	2.70E+00	<0.0001*****		140	PETRO STAR	NORTH
4.78E-04	170	8.13E-02	6.75E-07	3.97E-09	1.46E-05	206,000	1.89E+01	<0.0001450,000.		379	CASMALIA RESOURCES	CASMA
4.58E-04	5	2.19E-03	1.82E-08	3.80E-09	7.69E-09	12,500,000	1.64E+00	<0.0001*****		358	SOLVENT RECOV. SERVI.	LINDE
3.69E-04	1,270	4.70E-01	3.90E-06	3.06E-09	1.82E-07	556,000	3.33E+00	<0.0001*****		40	STAUFFER CHEMICAL	BATON
3.68E-04	38	1.40E-02	1.16E-07	3.05E-09	6.57E-09	613,000	4.08E-01	<0.0001*****		362	CHEMICAL RESOURCES	TULSA
3.50E-04	1,450	5.07E-01	4.21E-06	2.91E-09	1.13E-05	432,000	2.75E+01	<0.0001310,000.		133	BELCHER REF.	MOBIL
3.32E-04	<1	5.66E-05	4.70E-10	2.75E-09	4.70E-09	300,000	1.68E-02	<0.0001*****		14	DOW CHEMICAL	DALTO
3.28E-04	36	1.17E-02	9.73E-08	2.72E-09	1.72E-08	415,000	4.86E-01	<0.0001*****		26	MEAD JOHNSON	EVANS
3.12E-04	4	1.26E-03	1.05E-08	2.59E-09	5.15E-07	2,580,000	1.47E+01	<0.0001570,000.		106	DIAMOND SHAMROCK COR	DEER
2.85E-04	860	2.45E-01	2.04E-06	2.37E-09	3.08E-06	89,200	2.33E+00	<0.0001*****		378	IT CORPORATION	WESTM
2.01E-04	22	4.43E-03	3.67E-08	1.67E-09	1.92E-05	34,800	1.13E+00	<0.0001*****		138	CHEVRON	KENAI
1.91E-04	12	2.22E-03	1.84E-08	1.59E-09	3.28E-09	2,610,000	1.91E-01	<0.0001*****		119	LILLY IND. COATINGS	DALLA
1.68E-04	598	1.01E-01	8.34E-07	1.40E-09	2.08E-06	108,000	1.26E+00	<0.0001*****		143	BERRY PETROLEUM	STEVE
1.44E-04	1,850	2.66E-01	2.21E-06	1.19E-09	1.32E-06	551,000	2.57E+00	<0.0001*****		38	GEORGIA-PACIFIC CORP	PLAQU
1.43E-04	23	3.29E-03	2.73E-08	1.19E-09	3.91E-06	24,400	5.36E-01	<0.0001*****		250	BARRETT REF.	THOMA
1.41E-04	2,170	3.05E-01	2.54E-06	1.17E-09	4.91E-06	281,000	9.66E+00	<0.0001870,000.		13	ATLANTIC WOOD INDUST	SAVAN
1.34E-04	1,980	2.65E-01	2.20E-06	1.11E-09	2.63E-06	180,000	3.07E+00	<0.0001*****		95	RHONE-POULENC, INC.	MT. P
1.31E-04	<1	3.38E-05	2.80E-10	1.09E-09	1.85E-09	573,000	4.61E-02	<0.0001*****		8	DOW CHEMICAL	LEDYA
1.17E-04	5	5.85E-04	4.85E-09	9.72E-10	1.23E-09	1,330,000	1.17E-01	<0.0001*****		351	COMMERCIAL DISPOSAL	WEST
1.14E-04	24	2.73E-03	2.26E-08	9.50E-10	1.55E-09	5,190,000	1.65E-01	<0.0001*****		55	AMERICAN CYANAMID	BRIDG
1.14E-04	29	3.31E-03	2.75E-08	9.50E-10	1.36E-09	13,800,000	1.54E+00	<0.0001*****		360	CALLEIA RES. RECOVER	BROOK
7.75E-05	4	3.33E-04	2.77E-09	6.44E-10	3.68E-09	1,780,000	9.24E-02	<0.0001*****		83	PPG INDUSTRIES	NORTO
7.75E-05	<1	2.15E-06	1.79E-11	6.43E-10	3.84E-09	460,000	1.17E-02	<0.0001*****		93	DUPONT	LUGOF
7.45E-05	<1	1.28E-06	1.06E-11	6.18E-10	3.63E-09	3,440,000	6.67E-02	<0.0001*****		396	WAYNE DISPOSAL	BELE
7.30E-05	2	1.80E-04	1.49E-09	6.06E-10	2.96E-09	4,570,000	1.09E-01	<0.0001*****		373	ROLLINS ENV. SERVICE	BRIDG
7.30E-05	1	3.72E-05	3.09E-10	6.06E-10	3.10E-09	4,810,000	1.45E-01	<0.0001*****		63	HERCULES	GIBBS
7.11E-05	5	3.33E-04	2.76E-09	5.90E-10	3.15E-09	2,200,000	1.23E-01	<0.0001*****		21	MONSANTO CO	SAUGE
6.31E-05	33	2.08E-03	1.73E-08	5.24E-10	7.81E-06	6,710	1.49E-01	<0.0001*****		142	INTERMOUNTAIN REF.	FREDO
5.67E-05	681	3.36E-01	3.21E-07	4.71E-10	4.49E-07	163,000	4.93E-01	<0.0001*****		75	AYERST LABS	ROUSE

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TABLE D-3. (continued)

Summary for BENZENE REFINERIES
with a Unit Risk of $8.30E-06$

SIC= CAS=

Page 9 of 9

- M a x i m u m -					- - M i n i m u m - -								S o u r c e
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval				
4.62E-05	769	3.55E-02	2.95E-07	3.83E-10	7.57E-07	118,000	3.63E-01	<0.0001*****		52	KERR-MCGEE CHEM. COR	MERID	
2.74E-05	1,310	3.58E-02	2.97E-07	2.27E-10	5.73E-07	423,000	1.72E+00	<0.0001*****		392	PEORIA DISPOSAL CO.	PEORI	
1.38E-05	43	5.93E-04	4.92E-09	1.14E-10	5.93E-08	87,400	1.25E-01	<0.0001*****		123	UNION CARBIDE	SEADR	
9.42E-06	489	4.61E-03	3.82E-08	7.82E-11	2.70E-06	536	4.73E-03	<0.0001*****		234	NEVADA REF.	TONOP	
3.68E-06	203	7.46E-04	6.20E-09	3.05E-11	4.51E-08	552,000	1.15E-01	<0.0001*****		37	ETHYL CORP.	BATON	
1.00E-38		0.00E+00	0.00E+00	0.00E+00	1.00E+38		0.00E+00			130	ALDRICH CHEMICALS	MILWA	
1.00E-38		0.00E+00	0.00E+00	0.00E+00	1.00E+38		0.00E+00			136	ARCO ALASKA	KUPAR	

TABLE D-4. HEM RESULTS FOR CASE 2 (BASELINE MAXIMUM)

Summary for BENZENE
with a Unit Risk of 8.30E-06

SIC= CAS=

- M a x i m u m -					- - M i n i m u m - -								
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval	S o u r c e			
2.78E+02	1	2.81E+02	2.34E-03	2.30E-03	4.77E-03	361,000	1.92E+04	0.0023	440.	132	MOBAY CHEMICAL CORP	NEW M	
2.47E+02	<1	1.17E+02	9.71E-04	2.05E-03	7.80E-03	695,000	9.61E+04	0.011	88.	266	AMOCO	TEXAS	
2.35E+02	6	1.43E+03	1.18E-02	1.95E-03	4.20E-03	327,000	2.11E+05	0.025	40.	7	WITCO CORP.	OILDA	
2.21E+02	18	3.95E+03	3.28E-02	1.83E-03	7.92E-03	556,000	2.38E+05	0.028	35.	209	EXXON CORP	BATON	
2.05E+02	<1	9.90E+00	8.21E-05	1.70E-03	4.04E-03	2,590,000	1.46E+05	0.017	58.	290	SHELL OIL	DEER	
1.93E+02	<1	3.86E+01	3.21E-04	1.60E-03	8.23E-03	1,140,000	5.62E+04	0.0067	150.	218	BP OIL	BELLE	
1.79E+02	1	1.48E+02	1.22E-03	1.49E-03	4.31E-03	392,000	3.06E+04	0.0036	280.	108	DUPONT	BEAUM	
1.69E+02	<1	3.38E+01	2.80E-04	1.40E-03	1.55E-03	125,000	3.35E+03	0.0004	2,500.	304	ARCO PETROLEUM	FERND	
1.68E+02	<1	3.58E+01	2.97E-04	1.39E-03	5.86E-03	382,000	4.07E+04	0.0048	210.	352	ASHLAND CHEMICAL	BOYD	
1.61E+02	1	1.49E+02	1.23E-03	1.34E-03	5.38E-03	228,000	2.37E+04	0.0028	360.	207	CITGO PETROLEUM	LAKE	
1.50E+02	10	1.49E+03	1.23E-02	1.24E-03	5.16E-03	5,420,000	3.29E+05	0.039	26.	190	AMOCO CHEMICAL	WHITI	
1.48E+02	111	1.64E+04	1.36E-01	1.23E-03	2.39E-03	8,090,000	4.95E+05	0.059	17.	169	SHELL OIL	WILMI	
1.46E+02	11	1.64E+03	1.36E-02	1.21E-03	3.80E-03	7,970,000	3.32E+05	0.039	25.	149	CHEVRON	EL SE	
1.42E+02	1	9.62E+01	7.99E-04	1.18E-03	4.94E-03	397,000	4.92E+04	0.0058	170.	286	MOBIL OIL	BEAUM	
1.41E+02	2	2.99E+02	2.48E-03	1.17E-03	4.27E-03	3,070,000	1.27E+05	0.015	67.	150	CHEVRON	RICHM	
1.34E+02	<1	1.38E+01	1.15E-04	1.11E-03	8.99E-04	339,000	5.93E+04	0.0070	140.	267	CHAMPLIN PETROLEUM C	CORPU	
1.29E+02	<1	5.13E+01	4.26E-04	1.07E-03	3.31E-03	857,000	1.71E+04	0.0020	490.	121	MONSANTO CO	ALVIN	
1.27E+02	17	2.10E+03	1.74E-02	1.05E-03	3.39E-03	8,460,000	3.21E+05	0.038	26.	161	MOBIL OIL	TORRA	
1.22E+02	1	1.34E+02	1.12E-03	1.01E-03	7.73E-04	344,000	3.91E+04	0.0046	220.	270	COASTAL REFINING	CORPU	
1.15E+02	4	4.30E+02	3.57E-03	9.54E-04	2.82E-03	2,920,000	8.13E+04	0.0096	100.	176	UNION OIL OF CALIFOR	RODEO	
1.15E+02	<1	5.10E+01	4.24E-04	9.51E-04	6.66E-04	364,000	1.37E+04	0.0016	620.	281	KOCH INDUSTRIES	CORPU	
1.11E+02	4	4.33E+02	3.59E-03	9.23E-04	1.83E-03	8,070,000	2.45E+05	0.029	34.	172	TEXACO REFINING	WILMI	
1.07E+02	97	1.04E+04	8.59E-02	8.90E-04	3.60E-03	333,000	1.21E+05	0.014	70.	247	STANDARD OIL OF OHIO	LIMA	
1.07E+02	<1	1.36E+01	1.13E-04	8.88E-04	6.10E-03	1,190,000	2.12E+05	0.025	40.	214	MOBIL	CHALM	
1.04E+02	<1	1.16E+01	9.64E-05	8.61E-04	4.08E-03	359,000	2.57E+04	0.0031	330.	293	STAR REF.	PORT	
1.03E+02	<1	3.58E+01	2.97E-04	8.58E-04	3.70E-03	377,000	2.88E+04	0.0034	290.	201	ASHLAND PETROLEUM CO	ASHLA	
1.03E+02	1	8.61E+01	7.15E-04	8.55E-04	8.17E-04	228,000	4.73E+03	0.0006	1,800.	309	TEXACO USA	ANACO	
9.82E+01	1	8.99E+01	7.46E-04	8.15E-04	1.97E-03	2,670,000	8.45E+04	0.010	100.	271	CROWN CENTRAL	HOUST	
9.75E+01	18	1.72E+03	1.43E-02	8.09E-04	4.05E-03	52,700	6.13E+04	0.0073	140.	103	CELANESE CORP.	PAMPA	
9.50E+01	3	2.43E+01	2.01E-03	7.88E-04	6.19E-04	893,000	2.45E+04	0.0029	340.	92	UNION CARBIDE CARIBE	PONCE	
9.32E+01	2	1.62E+02	1.34E-03	7.74E-04	3.60E-03	720,000	1.79E+04	0.0021	470.	213	MARATHON PETROLEUM	GARYV	
9.23E+01	<1	1.10E+01	9.10E-05	7.66E-04	3.25E-03	1,900,000	4.60E+04	0.0055	180.	224	KOCH REFINING	ROSEM	
8.87E+01	2	2.04E+02	1.70E-03	7.36E-04	2.72E-03	225,000	2.41E+04	0.0029	350.	208	CONOCO CHEMICALS	WESTL	
8.70E+01	1	7.96E+01	6.61E-04	7.22E-04	2.40E-03	171,000	4.18E+03	0.0005	2,000.	288	PHILLIPS	SWEEN	
8.27E+01	<1	9.76E+00	8.10E-05	6.86E-04	2.89E-03	1,510,000	2.55E+04	0.0030	330.	187	MOBIL OIL	JOLIE	
8.06E+01	<1	3.83E+00	3.18E-05	6.69E-04	3.30E-03	2,060,000	4.93E+04	0.0058	170.	188	SHELL OIL	WOOD	
7.97E+01	46	3.66E+03	3.03E-02	6.62E-04	5.26E-04	338,000	7.84E+04	0.0093	110.	292	SOUTHWESTERN REFININ	CORPU	
7.80E+01	9	6.87E+02	5.70E-03	6.48E-04	1.10E-03	12,700,000	3.18E+05	0.038	27.	238	EXXON	LINDE	
7.76E+01	1	4.98E+01	4.13E-04	6.44E-04	2.39E-03	1,270,000	1.82E+04	0.0022	460.	217	SHELL CHEM CO	NORCO	
7.72E+01	6	4.38E+02	3.64E-03	6.41E-04	1.33E-03	7,880,000	1.46E+05	0.017	58.	174	UNION OIL OF CALIFOR	WILMI	
6.90E+01	<1	3.96E+01	3.29E-06	5.73E-04	5.04E-04	230,000	2.36E+03	0.0003	3,600.	306	SHELL OIL	ANACO	
6.88E+01	1	8.04E+01	6.68E-04	5.71E-04	3.10E-03	159,000	1.60E+04	0.0019	530.	186	MARATHON PETROLEUM	ROBIN	
6.82E+01	18	1.20E+03	9.96E-03	5.66E-04	2.41E-03	6,550,000	1.27E+05	0.015	66.	189	UNION OIL OF CALIFOR	LEMON	
6.75E+01	13	8.50E+02	7.05E-03	5.60E-04	2.66E-03	4,840,000	1.99E+05	0.024	42.	237	COASTAL EAGLE PT.	WESTV	
6.70E+01	1	3.7E+01	3.11E-04	5.56E-04	1.94E-03	388,000	1.80E+04	0.0021	470.	295	UNION OIL OF CALIFOR	NEDER	

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TABLE D-4. (continued)

Summary for BENZENE
with a Unit Risk of 8.30E-06

REFINERIES

SIC=

CAS=

Page 2 of 9

- M a x i m u m -					- - M i n i m u m - -										S o u r c e	
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval							
6.69E+01	33	2.18E+03	1.81E-02	5.55E-04	3.27E-03	817,000	9.34E+04	0.011	90.	249	SUN CO.	TOLED				
6.46E+01	21	1.37E+03	1.14E-02	5.36E-04	2.53E-03	4,450,000	1.26E+05	0.015	67.	263	SUN PETROLEUM	MARCU				
6.17E+01	<1	3.18E+00	2.64E-05	5.12E-04	2.43E-03	1,220,000	1.84E+04	0.0022	460.	10	STANDARD CHLORIDE CH	DELA				
6.13E+01	3	2.11E+02	1.75E-03	5.09E-04	2.22E-03	4,750,000	6.06E+04	0.0072	140.	394	WASTE CONVERSION	HATFI				
6.10E+01	207	1.27E+04	1.05E-01	5.06E-04	1.73E-03	8,640,000	3.71E+05	0.044	23.	175	UNOCAL	LOS A				
5.79E+01	1	8.34E+01	6.92E-04	4.81E-04	3.38E-03	707,000	3.78E+04	0.0045	220.	47	PARKE-DAVIS	HOLLA				
5.27E+01	<1	2.18E+01	1.81E-04	4.37E-04	4.11E-04	151,000	1.55E+03	0.0002	5,400.	307	SOHIO	FERND				
5.23E+01	1	2.95E+01	2.45E-04	4.34E-04	1.56E-03	772,000	2.47E+04	0.0029	340.	124	UNION CARBIDE CORP	TEXAS				
4.92E+01	<1	8.07E-01	6.70E-06	4.09E-04	1.93E-03	1,400,000	1.82E+04	0.0022	460.	179	STAR REF.	DELA				
4.68E+01	1	6.83E+01	5.67E-04	3.88E-04	2.25E-03	838,000	2.34E+04	0.0028	360.	248	STANDARD OIL OF OHIO	TOLED				
4.31E+01	27	1.17E+03	9.71E-03	3.58E-04	1.66E-03	4,440,000	1.02E+05	0.012	82.	262	BP OIL	MARCU				
3.92E+01	<1	1.23E+01	1.02E-04	3.25E-04	1.63E-03	4,830,000	8.02E+04	0.0095	110.	240	MOBIL OIL	PAULS				
3.88E+01	<1	9.35E-01	7.76E-06	3.22E-04	7.19E-04	379,000	3.90E+03	0.0005	2,200.	199	TEXACO REFINING	EL DO				
3.87E+01	89	3.45E+03	2.86E-02	3.22E-04	1.27E-03	2,680,000	7.96E+04	0.0094	110.	278	HILL PETROLEUM	HOUST				
3.84E+01	3	1.12E+02	9.27E-04	3.19E-04	6.65E-04	134,000	7.13E+03	0.0008	1,200.	196	FARMLAND INDUSTRIES	COFFE				
3.70E+01	4	1.42E+02	1.18E-03	3.07E-04	1.36E-03	2,280,000	4.85E+04	0.0058	170.	346	U.S. STEEL CORP.	CLAIR				
3.58E+01	18	6.27E+02	5.20E-03	2.97E-04	2.14E-03	1,190,000	6.98E+04	0.0083	120.	215	MURPHY OIL CORPORATI	HERAU				
3.52E+01	<1	5.39E+00	4.47E-05	2.92E-04	7.40E-04	4,900,000	3.56E+04	0.0042	240.	58	BASF WYANDOTTE CORP.	JAMES				
3.26E+01	3	1.13E+02	9.38E-04	2.71E-04	5.91E-04	147,000	6.69E+03	0.0008	1,300.	198	NATIONAL COOPERATIVE	MCPHE				
3.22E+01	13	4.24E+02	3.52E-03	2.67E-04	1.17E-03	697,000	2.05E+04	0.0024	410.	279	HILL PETROLEUM	TEXAS				
3.20E+01	44	1.42E+03	1.18E-02	2.66E-04	1.25E-03	4,900,000	2.07E+05	0.025	41.	257	ATLANTIC REFINING	PHILA				
3.20E+01	1	2.59E+01	2.15E-04	2.65E-04	4.76E-03	2,450,000	1.11E+05	0.013	76.	284	LYONDELL PETROCHEM	HOUST				
3.14E+01	<1	5.52E-01	4.58E-06	2.60E-04	8.14E-04	763,000	5.15E+03	0.0006	1,600.	183	HAWAII INDEP. REF.	EWB B				
3.03E+01	1	2.62E+01	2.18E-04	2.52E-04	2.56E-04	259,000	7.11E+03	0.0008	1,200.	282	LA GLORIA OIL AND GA	TYLER				
3.03E+01	<1	1.02E+01	8.46E-05	2.51E-04	3.47E-04	17,500	3.29E+02	<0.0001	26,000.	317	SINCLAIR OIL	SINCL				
3.00E+01	4	1.22E+02	1.01E-03	2.49E-04	2.73E-04	88,000	3.17E+03	0.0004	2,700.	255	TOTAL PETROLEUM	ARDMO				
2.97E+01	<1	4.42E-01	3.67E-06	2.47E-04	1.42E-03	3,380,000	2.66E+04	0.0032	320.	388	MICHIGAN DISPOSAL IN	BELLE				
2.82E+01	4	1.14E+02	9.43E-04	2.34E-04	5.58E-04	8,320,000	7.17E+04	0.0085	120.	72	STAUFFER CHEMICAL CO	EDISO				
2.68E+01	1	2.93E+01	2.43E-04	2.23E-04	1.19E-03	55,300	2.33E+03	0.0003	3,600.	287	PHILLIPS 66 REFINERY	BORGE				
2.65E+01	2	5.76E+01	4.78E-04	2.20E-04	1.56E-04	358,000	4.39E+03	0.0005	1,900.	296	VALERO ENERGY CORP.	CORPU				
2.60E+01	<1	4.59E-01	3.81E-06	2.16E-04	6.76E-04	763,000	4.28E+03	0.0005	2,000.	182	CHEVRON	HONOL				
2.58E+01	7	1.69E+02	1.40E-03	2.14E-04	8.64E-04	676,000	1.36E+04	0.0016	620.	285	MARATHON OIL	TEXAS				
2.53E+01	1	3.15E+01	2.61E-04	2.10E-04	6.60E-04	313,000	2.74E+03	0.0003	3,100.	51	FIRST CHEMICAL CORP	PASCA				
2.48E+01	<1	4.46E+00	3.71E-05	2.06E-04	4.75E-04	192,000	1.69E+03	0.0002	5,000.	264	UNITED REF.	WARRE				
2.46E+01	6	1.51E+02	1.25E-03	2.04E-04	1.05E-03	2,090,000	1.70E+04	0.0020	500.	185	CLARK OIL & REF.	HATFI				
2.46E+01	2	3.77E+01	3.13E-04	2.04E-04	1.06E-03	971,000	6.39E+03	0.0008	1,300.	303	AMOCO OIL REFINERY	YORKT				
2.37E+01	<1	9.21E+00	7.64E-05	1.97E-04	1.88E-04	34,700	1.03E+03	0.0001	8,200.	273	DIAMOND SHAMROCK REF	THREE				
2.25E+01	1	2.41E+01	2.00E-04	1.87E-04	3.04E-04	3,220,000	1.03E+04	0.0012	820.	164	PACIFIC REF.	HERCU				
2.25E+01	1	2.73E+01	2.26E-04	1.86E-04	4.38E-04	325,000	1.24E+04	0.0015	680.	171	TEXACO REFINING	BAKER				
2.21E+01	15	3.25E+02	2.70E-03	1.83E-04	3.61E-04	625,000	1.43E+04	0.0017	590.	253	SINCLAIR OIL	TULSA				
2.17E+01	1	1.38E+01	1.14E-04	1.80E-04	5.22E-04	1,640,000	1.42E+04	0.0017	590.	178	CONOCO	COMME				
2.14E+01	<1	8.84E-01	7.33E-06	1.77E-04	6.28E-04	346,000	1.46E+03	0.0002	5,800.	355	HANSBROUGH ENERGY	CROWL				
2.11E+01	2	4.56E+01	3.78E-04	1.75E-04	1.94E-04	335,000	6.95E+03	0.0008	1,200.	323	GULF STATES	GADSD				
2.10E+01	<1	3.66E+00	3.04E-05	1.75E-04	2.69E-04	1,760,000	8.33E+03	0.0010	1,000.	310	U.S. OIL & REFINING	TACOM				
2.09E+01	<1	1.11E-01	9.44E-06	1.73E-04	3.66E-04	75,300	7.10E+03	0.0008	1,200.	314	AMOCO	CASPE				

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TABLE D-4. (continued)

Summary for BENZENE REFINERIES
with a Unit Risk of 8.30E-06

SIC= CAS=

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- M a x i m u m -					- - M i n i m u m - -					S o u r c e				
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval					
2.08E+01	12	2.47E+02	2.05E-03	1.73E-04	2.57E-04	11,600,000	6.54E+04	0.0078	130.	236	CHEVRON		PERTH	
2.07E+01	1	1.08E+01	9.00E-05	1.72E-04	2.19E-04	92,200	6.32E+02	0.0001	13,000.	252	KERR MCGEE		WYNNE	
2.07E+01	1	2.02E+01	1.68E-04	1.72E-04	4.87E-04	1,270,000	6.31E+03	0.0007	1,300.	71	SOUTHLAND CORP.		GREAT	
2.06E+01	3	6.24E+01	5.18E-04	1.71E-04	2.65E-03	364,000	1.58E+04	0.0019	530.	277	FINA OIL & CHEMICAL		PORT	
2.05E+01	<1	8.90E+00	7.38E-05	1.70E-04	7.80E-04	38,900	6.92E+02	0.0001	12,000.	276	FINA OIL		BIG S	
1.99E+01	28	5.49E+02	4.55E-03	1.65E-04	4.94E-04	92,800	1.29E+04	0.0015	650.	145	LION OIL		EL DO	
1.98E+01	5	1.06E+02	8.79E-04	1.65E-04	7.03E-04	6,360,000	6.87E+04	0.0081	120.	184	CLARK OIL & REFINING		BLUE	
1.98E+01	2	2.99E+01	2.48E-04	1.64E-04	5.79E-04	399,000	3.33E+03	0.0004	2,500.	109	E I DUPONT DE NEMOUR		ORANG	
1.96E+01	14	2.82E+02	2.34E-03	1.63E-04	3.15E-04	921,000	1.36E+04	0.0016	620.	297	AMOCO OIL REFINERY		SALT	
1.94E+01	13	2.50E+02	2.07E-03	1.61E-04	7.21E-04	1,970,000	1.85E+04	0.0022	460.	319	ASHLAND PETROLEUM		ST. P	
1.91E+01	4	6.76E+01	5.61E-04	1.58E-04	8.84E-04	3,810,000	2.90E+04	0.0034	290.	222	MARATHON PET.		DETRO	
1.81E+01	13	2.43E+02	2.01E-03	1.50E-04	3.45E-04	2,590,000	2.96E+04	0.0035	280.	341	LTV STEEL		CLEVE	
1.78E+01	105	1.88E+03	1.56E-02	1.48E-04	2.63E-04	8,550,000	7.34E+04	0.0087	110.	165	PARAMOUNT PET.		PARAM	
1.76E+01	<1	1.31E+00	1.09E-05	1.46E-04	5.12E-04	154,000	6.85E+02	0.0001	12,000.	225	AMERADA HESS		PURVI	
1.73E+01	42	7.17E+02	5.95E-03	1.43E-04	6.60E-04	2,310,000	4.78E+04	0.0057	180.	343	LTV STEEL COMPANY		PITTS	
1.67E+01	14	2.27E+02	1.89E-03	1.39E-04	2.67E-04	12,200,000	5.75E+04	0.0068	150.	235	AMERADA-HESS		PORT	
1.66E+01	48	8.00E+02	6.64E-03	1.37E-04	7.51E-04	2,760,000	2.69E+04	0.0032	310.	153	EXXON		BENIC	
1.65E+01	2	3.59E+01	2.98E-04	1.37E-04	4.44E-04	555,000	5.74E+03	0.0007	1,500.	216	PLACID REFINING		PORT	
1.63E+01	1	1.34E+01	1.11E-04	1.35E-04	2.75E-04	725,000	4.52E+03	0.0005	1,900.	348	U.S. STEEL CORP.		PROVO	
1.63E+01	3	4.22E+01	3.50E-04	1.35E-04	1.95E-04	810,000	1.16E+04	0.0014	730.	320	ABC COKE		TARRA	
1.62E+01	25	3.98E+02	3.30E-03	1.35E-04	1.04E-03	494,000	2.28E+04	0.0027	370.	268	CHEVRON		EL PA	
1.56E+01	<1	3.93E-01	3.26E-06	1.29E-04	5.49E-04	5,490,000	1.48E+04	0.0017	570.	330	INLAND STEEL		E CHI	
1.56E+01	30	4.70E+02	3.90E-03	1.29E-04	2.65E-04	8,170,000	4.36E+04	0.0052	190.	154	FLETCHER OIL & REFIN		WILMI	
1.52E+01	36	5.48E+02	4.55E-03	1.26E-04	2.29E-04	8,630,000	5.87E+04	0.0070	140.	152	EDGINGTON OIL COMPAN		LONG	
1.52E+01	1	8.11E+00	6.73E-05	1.26E-04	2.71E-04	110,000	1.15E+03	0.0001	7,300.	200	TOTAL PETROLEUM		ARKAN	
1.49E+01	34	5.01E+02	4.16E-03	1.24E-04	3.88E-04	381,000	1.74E+04	0.0021	490.	203	PENNZOIL		SHREV	
1.48E+01	<1	8.08E-01	6.71E-06	1.23E-04	2.60E-04	75,300	5.05E+03	0.0006	1,700.	316	LITTLE AMERICA REF.		CASPE	
1.46E+01	12	1.69E+02	1.40E-03	1.21E-04	4.62E-04	78,500	5.35E+03	0.0006	1,600.	245	AMOCO		MANDA	
1.44E+01	28	4.08E+03	3.39E-03	1.20E-04	3.83E-04	1,160,000	2.27E+04	0.0027	370.	342	BETHLEHEM STEEL CORP		BETHL	
1.41E+01	54	7.66E+02	6.36E-03	1.17E-04	1.93E-04	1,940,000	2.08E+04	0.0025	400.	381	CECOS		STAMP	
1.40E+01	22	3.06E+02	2.54E-03	1.16E-04	4.88E-04	2,190,000	1.65E+04	0.0020	510.	338	ARMCO INC		MIDDL	
1.39E+01	8	1.07E+02	8.88E-04	1.16E-04	1.19E-04	837,000	7.51E+03	0.0009	1,100.	244	CIBRO PETROLEUM		ALBAN	
1.39E+01	2	2.32E+01	1.92E-04	1.15E-04	3.45E-04	1,630,000	1.08E+04	0.0013	780.	177	COLORADO REF.		COMME	
1.37E+01	16	2.22E+02	1.84E-03	1.14E-04	2.52E-04	463,000	1.52E+04	0.0018	560.	195	DERBY REFINING COMPA		WICHI	
1.35E+01	<1	2.65E+00	2.20E-05	1.12E-04	1.68E-04	108,000	2.60E+03	0.0003	3,200.	232	EXXON		BILLI	
1.34E+01	16	2.12E+02	1.76E-03	1.11E-04	1.72E-04	111,000	8.41E+03	0.0010	1,000.	231	CONOCO REFINERY		BILLI	
1.33E+01	71	9.45E+02	7.84E-03	1.11E-04	1.63E-04	131,000	6.74E+03	0.0008	1,300.	289	PRIDE REFINING		ABILE	
1.33E+01	<1	4.41E+00	3.66E-05	1.10E-04	4.02E-04	790,000	7.70E+03	0.0009	1,100.	322	KOPPERS		WOODW	
1.32E+01	<1	3.35E+00	2.78E-05	1.10E-04	1.93E-04	69,300	4.54E+03	0.0005	1,900.	315	FRONTIER OIL		CHEYE	
1.27E+01	44	5.51E+02	4.57E-03	1.05E-04	3.13E-03	8,180,000	4.46E+05	0.053	19.	147	ATLANTIC RICHFIELD		CARSO	
1.21E+01	7	8.31E+01	6.90E-04	1.00E-04	7.88E-04	434,000	7.61E+03	0.0009	1,100.	135	LOUISIANA LAND & EXP		SARAL	
1.20E+01	2	2.56E+01	2.13E-04	9.97E-05	6.91E-04	1,160,000	7.00E+03	0.0008	1,200.	193	ROCK ISLAND REFINING		INDIA	
1.19E+01	1	9.84E+00	8.17E-05	9.89E-05	6.13E-04	1,030,000	7.54E+03	0.0009	1,100.	349	WHEELING PITT		E STE	
1.16E+01	<1	1.13E+00	9.40E-06	9.63E-05	2.10E-04	924,000	2.67E+03	0.0003	3,200.	302	PHILLIPS 66		WOODS	
1.12E+01	2	2.35E+01	1.95E-04	9.28E-05	8.96E-04	1,220,000	1.76E+04	0.0021	480.	246	ASHLAND OIL		CANTO	

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TABLE D-4. (continued)

Summary for BENZENE
with a Unit Risk of 8.30E-06

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CAS=

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- - M i n i m u m - -

Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval	S o u r c e		
1.11E+01	3	3.14E+01	2.61E-04	9.23E-05	1.83E-04	115,000	1.58E+03	0.0002	5,300.	230	CENEX REF.	LAURE
1.09E+01	<1	4.64E+00	3.85E-05	9.03E-05	3.94E-04	204,000	2.62E+03	0.0003	3,200.	291	SHELL OIL REFINERY	ODESS
1.02E+01	<1	7.01E-01	5.82E-06	8.48E-05	1.98E-04	3,080,000	5.35E+03	0.0006	1,600.	45	VISTA CHEMICAL	BALTI
9.65E+00	14	1.39E+02	1.15E-03	8.01E-05	1.55E-04	921,000	6.71E+03	0.0008	1,300.	298	BIG WEST OIL	SALT
9.61E+00	1	1.07E+01	8.89E-05	7.97E-05	2.10E-04	248,000	4.97E+02	0.0001	17,000.	211	HILL PETROLEUM	ST. R
8.72E+00	<1	2.10E-01	1.75E-06	7.24E-05	1.62E-04	379,000	8.78E+02	0.0001	9,600.	194	DERBY REF.	EL DO
8.70E+00	13	1.17E+02	9.71E-04	7.22E-05	9.12E-06	1,060,000	5.23E+03	0.0006	1,600.	280	HOWELL HYDROCARBONS	SAN A
8.45E+00	46	3.88E+02	3.22E-03	7.02E-05	5.58E-05	338,000	8.31E+03	0.0010	1,000.	294	TRIPINERY	CORPU
8.20E+00	2	1.75E+01	1.45E-04	6.80E-05	1.97E-04	196,000	1.99E+03	0.0002	4,200.	313	MURPHY OIL CORPORATI	SUPER
8.00E+00	35	2.80E+02	2.32E-03	6.64E-05	6.77E-04	2,910,000	3.64E+04	0.0043	230.	168	SHELL OIL	MARTI
7.92E+00	<1	1.43E-01	1.19E-06	6.57E-05	7.25E-05	249,000	8.80E+02	0.0001	9,600.	110	EASTMAN KODAK, INC.	LONGV
7.89E+00	2	1.37E+01	1.14E-04	6.55E-05	1.21E-04	61,000	4.79E+02	0.0001	18,000.	241	BLOOMFIELD REFINING	BLOOM
7.84E+00	4	2.78E+01	2.30E-04	6.51E-05	3.63E-04	3,810,000	1.19E+04	0.0014	710.	350	DETROIT COKE	DETRI
7.61E+00	20	1.53E+02	1.27E-03	6.32E-05	2.57E-04	807,000	1.05E+04	0.0012	800.	324	SLOSS INDUSTRIES	BIRMI
7.47E+00	1	4.51E+00	3.74E-05	6.20E-05	3.21E-04	4,490,000	8.51E+03	0.0010	990.	239	MANTUA OIL	THORO
7.43E+00	2	1.68E+01	1.39E-04	6.17E-05	3.24E-04	826,000	5.39E+03	0.0006	1,600.	354	ENVIROSAFE SERVICES	OREGO
7.20E+00	35	2.52E+02	2.09E-03	5.98E-05	6.10E-04	2,910,000	3.28E+04	0.0039	260.	173	TOSCO CORP.	MARTI
7.17E+00	1	4.26E+00	3.54E-05	5.95E-05	4.43E-04	495,000	1.10E+04	0.0013	770.	274	EL PASO REFINING	EL PA
6.97E+00	<1	1.21E+00	1.01E-05	5.78E-05	8.90E-05	1,760,000	2.76E+03	0.0003	3,100.	308	SOUND REF.	TACOM
6.94E+00	9	6.17E+01	5.12E-04	5.76E-05	1.02E-04	1,240,000	4.12E+03	0.0005	2,000.	335	TONAWANDA	TONAW
6.88E+00	44	3.05E+02	2.53E-03	5.71E-05	4.54E-04	424,000	6.53E+03	0.0008	1,300.	332	ARMCO INC.	ASHLA
6.41E+00	1	8.92E+00	7.40E-05	5.32E-05	2.21E-04	297,000	2.03E+03	0.0002	4,100.	339	NEW BOSTON COKE	PORTS
6.07E+00	10	6.23E+01	5.17E-04	5.04E-05	1.39E-04	4,530,000	5.20E+03	0.0006	1,600.	162	NEWHALL REFINING CO.	NEWHAL
5.92E+00	7	4.33E+01	3.59E-04	4.91E-05	7.80E-03	349,000	3.14E+04	0.0037	270.	269	CHEVRON	PORT
5.84E+00	3	1.57E+01	1.30E-04	4.85E-05	3.15E-04	1,190,000	1.32E+04	0.0016	640.	329	CITIZENS GAS	INDIA
5.82E+00	265	1.54E+03	1.28E-02	4.83E-05	8.51E-04	8,730,000	1.20E+05	0.014	70.	166	POWERINE OIL	SANTA
5.57E+00	1	4.85E+00	4.02E-05	4.63E-05	1.02E-04	207,000	3.90E+02	<0.0001	22,000.	260	PENNZOIL COMPANY	ROUSE
5.55E+00	<1	2.24E-01	1.86E-06	4.61E-05	2.42E-04	279,000	1.96E+03	0.0002	4,300.	180	AMOCO	SAVAN
5.27E+00	71	3.72E+02	3.08E-03	4.37E-05	8.21E-05	8,200,000	1.81E+04	0.0021	470.	148	CHEMOIL	SIGNA
5.12E+00	112	5.73E+02	4.76E-03	4.25E-05	1.60E-03	2,030,000	3.50E+04	0.0041	240.	98	AMERICAN HOECHST COR	HOUST
5.04E+00	6	3.12E+01	2.59E-04	4.19E-05	1.80E-04	6,100,000	1.13E+04	0.0013	750.	327	LTV STEEL	S CHI
4.93E+00	54	2.67E+02	2.22E-03	4.09E-05	1.76E-04	6,210,000	1.80E+04	0.0021	470.	326	ACME STEEL	CHICA
4.86E+00	17	8.41E+01	6.98E-04	4.04E-05	2.10E-04	2,180,000	7.37E+03	0.0009	1,100.	325	NATIONAL STEEL	GRANI
4.77E+00	6	2.99E+01	2.48E-04	3.96E-05	9.53E-05	325,000	5.33E+03	0.0006	1,600.	159	KERN OIL & REFINING	BAKER
4.77E+00	1	5.79E+00	4.81E-05	3.96E-05	9.29E-05	325,000	2.64E+03	0.0003	3,200.	167	SAN JOAQUIN REF.	BAKER
4.56E+00	<1	2.14E+00	1.77E-05	3.78E-05	2.08E-04	1,000,000	2.95E+03	0.0004	2,900.	337	LTV STEEL	WARRE
4.49E+00	2	6.94E+00	5.76E-05	3.72E-05	1.60E-04	4,400,000	3.95E+03	0.0005	2,100.	331	U.S. STEEL CORP.	GARY
4.23E+00	54	2.27E+02	1.88E-03	3.51E-05	1.15E-04	562,000	5.15E+03	0.0006	1,600.	334	NATIONAL STEEL GROUP	ECORS
4.11E+00	15	6.14E+01	5.09E-04	3.42E-05	2.11E-04	2,410,000	1.14E+04	0.0013	740.	345	SHENANGO	SHENA
4.11E+00	<1	1.46E+00	1.21E-05	3.41E-05	6.63E-05	929,000	1.80E+03	0.0002	4,700.	300	CRYSAN REFINING	WOODS
4.07E+00	265	1.08E+03	9.96E-03	3.38E-05	5.96E-04	8,730,000	8.38E+04	0.0099	100.	156	GOLDEN WEST REFINING	SANTA
4.05E+00	<1	1.63E+00	1.36E-05	3.36E-05	7.80E-05	126,000	1.34E+02	<0.0001	63,000.	229	SOUTHLAND OIL	SANDE
4.02E+00	3	1.03E+01	9.52E-05	3.33E-05	2.62E-05	893,000	1.03E+03	0.0001	8,100.	91	UNION CARBIDE	PENUE
3.99E+00	<1	3.28E-01	2.72E-06	3.31E-05	2.35E-04	326,000	9.80E+02	0.0001	8,600.	191	INDIANA FARM BUREAU	MT. V
3.96E+00	65	2.59E+02	2.15E-03	3.29E-05	6.75E-05	1,310,000	1.02E+04	0.0012	830.	256	CHEVRON	PORTL

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TABLE D-4. (continued)

Summary for BENZENE REFINERIES
with a Unit Risk of 8.30E-06

SIC= CAS=

- M a x i m u m -					- M i n i m u m -					Annual Repeat		S o u r c e
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Incidence	Interval			
3.95E+00	705	2.78E+03	2.31E-02	3.28E-05	5.01E-03	2,210,000	1.08E+05	0.013	78.	275	EXXON CORP	BAYTO
3.92E+00	7	2.90E+01	2.41E-04	3.25E-05	2.04E-04	1,170,000	5.30E+03	0.0006	1,600.	27	REILLY TAR AND CHEM	INDIA
3.82E+00	<1	8.69E-01	7.21E-06	3.17E-05	7.25E-05	30,900	5.99E+01	<0.0001	140,000.	301	PENNZOIL	ROOSE
3.79E+00	<1	9.56E-02	7.94E-07	3.15E-05	1.30E-04	137,000	7.05E+02	0.0001	12,000.	107	DOW CHEMICAL USA	FREEP
3.59E+00	21	7.62E+01	6.32E-04	2.98E-05	2.09E-05	382,000	1.45E+03	0.0002	5,800.	397	TEXAS ECOLOGISTS	ROBST
3.59E+00	1	2.39E+00	1.98E-05	2.98E-05	1.46E-04	110,000	1.96E+03	0.0002	4,300.	227	ERGON REF.	VICKS
3.52E+00	1	4.27E+00	3.55E-05	2.92E-05	6.85E-05	325,000	1.94E+03	0.0002	4,300.	170	SUNLAND REF.	BAKER
3.46E+00	2	5.25E+00	4.36E-05	2.88E-05	5.04E-04	935,000	9.85E+03	0.0012	860.	299	CHEVRON	SALT
3.46E+00	<1	7.82E-01	6.49E-06	2.87E-05	6.61E-05	428,000	5.22E+02	0.0001	16,000.	30	VULCAN MATERIALS	WICHI
3.42E+00	1	2.80E+00	2.32E-05	2.84E-05	9.80E-05	158,000	2.94E+02	<0.0001	29,000.	101	CAIN CHEMICAL	BRAZO
3.18E+00	1	2.05E+00	1.70E-05	2.64E-05	2.67E-05	102,000	1.56E+02	<0.0001	54,000.	126	WITCO CHEMICAL CORP	POINT
3.16E+00	<1	6.40E-01	5.31E-06	2.63E-05	1.38E-03	2,560,000	3.49E+04	0.0041	240.	374	ROLLINS ENV. SERVICE	DEER
3.12E+00	<1	6.84E-01	5.68E-06	2.59E-05	6.75E-04	924,000	1.92E+04	0.0023	440.	265	MAPCO PETROLEUM	MEMPH
3.01E+00	1	2.98E+00	2.47E-05	2.50E-05	1.06E-04	209,000	3.34E+02	<0.0001	25,000.	151	CONOCO	SANTA
2.84E+00	12	3.50E+01	2.91E-04	2.36E-05	1.07E-04	2,110,000	2.60E+03	0.0003	3,200.	347	SHARON STEEL	MONES
2.83E+00	4	1.22E+01	1.01E-04	2.35E-05	5.22E-05	10,500,000	6.24E+03	0.0007	1,400.	64	INT'L FLAVORS & FRAG	UNION
2.70E+00	1	3.45E+00	2.86E-05	2.24E-05	9.01E-05	1,380,000	6.19E+02	0.0001	14,000.	387	CECOS INT'L	WILLI
2.65E+00	16	4.12E+01	3.42E-04	2.20E-05	4.87E-04	287,000	2.35E+03	0.0003	3,600.	223	TOTAL PETROLEUM	ALMA
2.57E+00	2	5.30E+00	4.40E-05	2.14E-05	7.89E-05	225,000	7.22E+02	0.0001	12,000.	204	CALCASIEU REFINING	LAKE
2.57E+00	4	9.70E+00	8.05E-05	2.13E-05	5.55E-05	197,000	4.12E+02	<0.0001	20,000.	259	WITCO CHEMICAL CORP.	BRADF
2.46E+00	3	6.68E+00	5.55E-05	2.04E-05	1.98E-05	859,000	9.04E+02	0.0001	9,300.	77	GENERAL ELECTRIC	WATER
2.41E+00	3	6.44E+00	5.34E-05	2.00E-05	1.44E-04	9,580	2.74E+02	<0.0001	31,000.	318	WYOMING REF.	NEWCA
2.39E+00	6	1.45E+01	1.21E-04	1.99E-05	4.28E-05	327,000	2.15E+03	0.0003	3,900.	155	WITCO CORP.	OILDA
2.34E+00	50	1.16E+02	9.64E-04	1.95E-05	4.85E-05	83,000	2.83E+03	0.0003	3,000.	233	MONTANA REFINING COM	GREAT
2.33E+00	40	9.34E+01	7.76E-04	1.93E-05	6.88E-05	8,530,000	1.11E+04	0.0013	760.	160	LUNDAY-THAGARD CO.	SOUTH
2.27E+00	1	2.53E+00	2.10E-05	1.88E-05	4.95E-05	248,000	1.18E+02	<0.0001	72,000.	212	KERR-MCGEE REFINING	COTTO
2.24E+00	<1	2.39E-01	1.98E-06	1.86E-05	2.18E-03	4,870,000	2.17E+05	0.026	39.	258	CHEVRON	PHILA
2.22E+00	1	2.30E+00	1.91E-05	1.84E-05	7.69E-05	415,000	2.80E+02	<0.0001	30,000.	80	ARIS TECH CHEMICAL	HAVER
2.22E+00	<1	5.99E-02	4.97E-07	1.84E-05	4.70E-05	230,000	6.68E+01	<0.0001	130,000.	146	ANCHOR REF.	MCKIT
2.10E+00	9	1.98E+01	1.64E-04	1.74E-05	9.43E-05	831,000	2.81E+03	0.0003	3,000.	340	TOLEDO COKE	TOLED
2.10E+00	<1	4.73E-01	3.92E-06	1.74E-05	9.35E-04	626,000	1.59E+04	0.0019	530.	254	SUN REFINING	TULSA
2.03E+00	17	3.48E+01	2.89E-04	1.69E-05	3.71E-05	2,790,000	7.71E+03	0.0009	1,100.	44	FMC CORP.	BALTI
2.02E+00	1	2.83E+00	2.35E-05	1.67E-05	1.03E-04	927,000	8.24E+02	0.0001	10,000.	312	QUAKER STATE OIL REF	NEWEL
2.01E+00	111	2.23E+02	1.85E-03	1.67E-05	3.25E-05	8,090,000	6.72E+03	0.0008	1,300.	158	HUNTWAY REF.	WILMI
1.96E+00	4	7.82E+00	6.49E-05	1.63E-05	2.02E-05	2,090,000	1.96E+03	0.0002	4,300.	305	CHEVRON	SEATT
1.90E+00	2	3.79E+00	3.14E-05	1.58E-05	5.36E-05	168,000	1.21E+02	<0.0001	70,000.	228	SOUTHLAND OIL	LUMBE
1.81E+00	723	1.31E+03	1.09E-02	1.51E-05	1.20E-03	92,400	1.09E+04	0.0013	780.	251	CONOCO	PONCA
1.77E+00	1	1.56E+00	1.30E-05	1.47E-05	5.12E-05	97,800	1.07E+02	<0.0001	79,000.	144	CROSS OIL & REFINING	SMACK
1.70E+00	12	1.97E+01	1.64E-04	1.41E-05	3.00E-05	1,690,000	1.07E+03	0.0001	7,900.	181	YOUNG REF.	DOUGL
1.55E+00	2	3.30E+00	2.74E-05	1.29E-05	4.79E-05	4,560,000	1.78E+03	0.0002	4,700.	57	ATLANTIC WOOD INDUST	HAINE
1.55E+00	24	3.65E+01	3.03E-04	1.28E-05	3.56E-04	2,440,000	7.75E+03	0.0009	1,100.	333	BETHLEHEM STEEL CORP	SPARR
1.54E+00	4,530	6.98E+03	5.79E-02	1.28E-05	1.23E-03	2,380,000	4.31E+04	0.0051	200.	97	AMERICAN HOECHST COR	PASAD
1.52E+00	<1	1.05E-02	8.71E-08	1.26E-05	3.22E-05	144,000	3.33E+01	<0.0001	250,000.	283	LIQUID ENERGY CORP.	BRIDG
1.42E+00	3	4.90E+00	4.06E-05	1.18E-05	6.91E-05	234,000	2.04E+02	<0.0001	41,000.	311	MIDATLANTIC REF.	ST. M
1.37E+00	40	5.45E+01	4.52E-04	1.13E-05	3.60E-05	609,000	2.15E+03	0.0003	3,900.	163	OXNARD REF.	OXNAR

TABLE D-4. (continued)

Summary for BENZENE
with a Unit Risk of 8.30E-06

REFINERIES

SIC=

CAS=

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- M a x i m u m -					- - M i n i m u m - -					S o u r c e	
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval		
1.20E+00	2	2.40E+00	1.99E-05	9.92E-06	5.46E-05	166,000	2.19E+02	<0.0001	38,000.	202	SOMERSET REFINERY SOMER
1.19E+00	1	1.14E+00	9.46E-06	9.91E-06	2.99E-05	389,000	1.01E+02	<0.0001	84,000.	205	CALUMET REFINING COM PRINC
1.17E+00	1	8.32E-01	6.91E-06	9.73E-06	6.00E-05	292,000	1.29E+02	<0.0001	65,000.	192	LAKETON REFINING LAKET
9.90E-01	106	1.05E+02	8.71E-04	8.21E-06	3.29E-04	1,270,000	1.45E+04	0.0017	580.	336	BETHLEHEM STEEL LACKA
9.51E-01	13	1.24E+01	1.03E-04	7.89E-06	1.93E-05	2,690,000	1.03E+03	0.0001	8,200.	359	ERIEWAY POLL. CONTRO BEDFO
8.74E-01	7	5.69E+00	4.72E-05	7.26E-06	3.54E-05	506,000	1.27E+03	0.0002	6,600.	221	LAKESIDE REF. KALAM
7.63E-01	1	7.43E-01	6.17E-06	6.33E-06	1.33E-05	300,000	7.48E+01	<0.0001	110,000.	380	IT CORP.-PETROL. WAS BUTTO
7.58E-01	37	2.82E+01	2.34E-04	6.29E-06	2.73E-05	1,190,000	2.07E+03	0.0002	4,100.	369	ECOLOTEC DAYTO
7.52E-01	13	9.78E+00	8.11E-05	6.24E-06	7.74E-05	2,580,000	1.14E+03	0.0001	7,400.	78	NEPERA CHEMICAL CO., HARRI
7.34E-01	<1	5.72E-02	4.75E-07	6.09E-06	2.95E-05	3,430,000	7.32E+02	0.0001	12,000.	62	DUPONT DEEPW
7.07E-01	2	1.11E+00	9.19E-06	5.87E-06	2.01E-05	2,110,000	3.61E+02	<0.0001	23,000.	398	DELAWARE CONTAINERS COATS
7.05E-01	1	4.98E-01	4.13E-06	5.85E-06	2.39E-05	253,000	5.18E+01	<0.0001	160,000.	220	CRYSTAL REF. CARSO
6.63E-01	<1	2.58E-01	2.14E-06	5.50E-06	2.12E-05	551,000	9.56E+01	<0.0001	88,000.	36	DOW CHEMICAL PLAQU
6.16E-01	48	2.98E+01	2.47E-04	5.11E-06	2.79E-05	2,760,000	1.00E+03	0.0001	8,400.	157	HUNTWAY REF. BENEC
5.83E-01	16	9.44E+00	7.84E-05	4.84E-06	4.09E-06	1,230,000	1.54E+02	<0.0001	55,000.	4	ALPHA RESINS PERRI
4.82E-01	<1	4.12E-02	3.42E-07	4.00E-06	1.35E-05	574,000	6.16E+01	<0.0001	140,000.	39	RUBICOM CHEMICALS IN GEISM
4.74E-01	<1	1.32E-02	1.09E-07	3.94E-06	7.94E-06	925,000	2.04E+02	<0.0001	41,000.	393	PETROCHEM RECYCLING SALT
4.60E-01	<1	6.95E-03	5.77E-08	3.82E-06	1.84E-05	4,450,000	7.40E+02	0.0001	11,000.	67	MONSANTO CO BRIDG
4.41E-01	10	4.47E+00	3.71E-05	3.66E-06	2.27E-05	2,070,000	3.90E+02	<0.0001	22,000.	87	ATLANTIC RICHFIELD C MONAC
4.21E-01	28	1.17E+01	9.71E-05	3.50E-06	4.34E-04	455,000	1.55E+03	0.0002	5,400.	74	MONTROSE CHEMICAL CO HENDE
4.17E-01	1	2.80E-01	2.32E-06	3.46E-06	1.31E-05	511,000	1.63E+02	<0.0001	52,000.	46	DOW CORNING MIDLA
4.08E-01	1	2.39E-01	1.98E-06	3.38E-06	1.12E-05	278,000	1.68E+01	<0.0001	150,000.	20	GOODRICH, (B.F.) HENRY
3.87E-01	<1	1.11E-01	9.23E-07	3.21E-06	1.39E-05	6,100,000	7.95E+02	0.0001	11,000.	368	CHEM. WASTE MGMT. CALUM
3.81E-01	20	7.68E+00	6.37E-05	3.16E-06	9.49E-05	333,000	1.53E+03	0.0002	5,500.	344	ERIE COKE ERIE
3.80E-01	23	8.74E+00	7.26E-05	3.16E-06	2.20E-03	547,000	7.31E+03	0.0009	1,200.	219	STAR REF. CONVE
3.52E-01	49	1.72E+01	1.43E-04	2.92E-06	1.29E-05	1,670,000	9.11E+02	0.0001	9,300.	383	CECOS INT'L CINCI
3.32E-01	1	1.88E-01	1.56E-06	2.75E-06	1.49E-05	1,150,000	2.57E+02	<0.0001	33,000.	129	ATLANTIC WOOD INDUST PORTS
3.24E-01	233	7.54E+01	6.26E-04	2.69E-06	6.75E-03	284,000	1.01E+04	0.0012	840.	226	CHEVRON PASCA
2.41E-01	<1	3.96E-02	3.29E-07	2.00E-06	1.55E-05	168,000	1.06E+01	<0.0001	1800,000.	12	OLIN CORP. ST. M
2.17E-01	3	7.12E-01	5.91E-06	1.80E-06	4.79E-06	834,000	5.99E+01	<0.0001	140,000.	11	ALPHA CHEMICAL LAKEL
2.08E-01	17	3.59E+00	2.98E-05	1.73E-06	1.08E-05	2,390,000	4.33E+02	0.0001	19,000.	88	CALGON CARBON NEVIL
2.06E-01	35	7.19E+00	5.97E-05	1.71E-06	3.66E-06	2,540,000	3.16E+02	<0.0001	27,000.	116	HEAT ENERGY TECH. DALLA
2.06E-01	163	3.36E+01	2.79E-04	1.71E-06	1.08E-04	2,640,000	4.19E+03	0.0005	2,000.	112	GEORGIA-PACIFIC CORP PASAD
1.95E-01	497	9.70E+01	8.05E-04	1.62E-06	9.22E-05	189,000	8.73E+02	0.0001	9,700.	321	EMPIRE COKE COMPANY TUSCA
1.74E-01	2	4.32E-01	3.59E-06	1.44E-06	7.52E-06	4,790,000	3.52E+02	<0.0001	24,000.	61	DUPONT GIBBS
1.70E-01	1	9.84E-02	8.16E-07	1.41E-06	5.41E-06	42,300	4.50E+00	<0.0001	*****	104	COSDEN OIL & CHEMICA BIG S
1.59E-01	6	9.49E-01	7.88E-06	1.32E-06	4.37E-06	297,000	4.05E+01	<0.0001	1210,000.	53	REICHHOLD CHEMICALS GULFP
1.58E-01	230	3.63E+01	3.01E-04	1.31E-06	5.16E-04	2,360,000	4.05E+03	0.0005	2,100.	328	BETHLEHEM STEEL BURNS
1.50E-01	28	4.19E+00	3.47E-05	1.24E-06	5.21E-06	2,340,000	3.42E+02	<0.0001	25,000.	89	KOPPERS CO INC BRIDG
1.23E-01	1	1.34E-01	1.11E-06	1.02E-06	6.86E-06	372,000	4.04E+01	<0.0001	1210,000.	16	NIPRO, INC. AUGUS
1.20E-01	163	1.96E+01	1.63E-04	9.99E-07	6.28E-05	2,640,000	2.45E+03	0.0003	3,400.	111	GEORGIA GULF CORP. PASAD
1.17E-01	360	4.21E+01	3.49E-04	9.70E-07	8.64E-04	76,500	6.12E+02	0.0001	14,000.	139	MAPCO PETROLEUM NORTH
1.15E-01	22	2.56E+00	2.12E-05	9.55E-07	3.07E-06	93,500	3.09E+01	<0.0001	1270,000.	353	ENSCO EL DO
1.11E-01	10	1.11E+00	9.20E-06	9.20E-07	1.34E-06	13,300,000	7.73E+02	0.0001	11,000.	73	TROY CHEMICAL CORP., NEWAR
1.05E-01	38	4.00E+00	3.32E-05	8.71E-07	2.34E-06	2,600,000	1.74E+02	<0.0001	48,000.	122	S.D.S. BIOTECH CORP. HOUST

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TABLE D-4. (continued)

Summary for BENZENE REFINERIES
with a Unit Risk of 8.30E-06

SIC= CAS=

- M a x i m u m -					- - M i n i m u m - -					Annual Repeat		S o u r c e
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Incidence	Interval			
9.16E-02	21	1.89E+00	1.57E-05	7.61E-07	1.44E-06	12,500,000	4.19E+02	0.0001	20,000.	66	MOBAY CORP.	HALED
9.02E-02	70	6.33E+00	5.25E-05	7.49E-07	1.26E-06	12,900,000	5.68E+02	0.0001	15,000.	70	REICHHOLD CHEMICALS	ELIZA
8.19E-02	<1	1.82E-02	1.51E-07	6.80E-07	2.72E-06	103,000	1.98E+00	<0.0001	*****	372	ROGERS LANDFILL	CENTR
7.46E-02	<1	3.32E-02	2.76E-07	6.19E-07	4.34E-07	364,000	8.92E+00	<0.0001	950,000.	117	KOCH INDUSTRIES	CORPU
7.39E-02	1	3.73E-02	3.09E-07	6.14E-07	2.25E-06	223,000	2.18E+01	<0.0001	390,000.	42	VISTA CHEMICAL	WESTL
6.47E-02	525	3.40E+01	2.82E-04	5.37E-07	2.87E-04	406,000	2.98E+03	0.0004	2,800.	134	HUNT REFINING	TUSCA
5.93E-02	80	4.72E+00	3.92E-05	4.92E-07	1.21E-06	9,100,000	2.36E+02	<0.0001	36,000.	6	LILLY COATINGS	MONTE
5.67E-02	<1	7.55E-03	6.27E-08	4.70E-07	1.90E-06	1,800,000	2.38E+01	<0.0001	350,000.	48	3-M COMPANY	COTTA
5.45E-02	387	2.11E+01	1.75E-04	4.52E-07	9.78E-04	27,100	2.68E+02	<0.0001	31,000.	272	DIAMOND SHAMROCK	SUNRA
4.82E-02	<1	2.69E-03	2.24E-08	4.00E-07	4.71E-07	2,520,000	9.26E+00	<0.0001	1910,000.	377	IT CORPORATION	BENEC
4.67E-02	1	2.68E-02	2.22E-07	3.87E-07	1.68E-06	395,000	1.17E+01	<0.0001	1720,000.	120	MOBIL CHEMICALS	BEAUM
4.54E-02	2	7.43E-02	6.16E-07	3.77E-07	1.56E-06	1,570,000	3.31E+01	<0.0001	1250,000.	82	MONSANTO CO	ADDYS
4.31E-02	8	3.35E-01	2.78E-06	3.57E-07	6.24E-07	2,060,000	3.54E+01	<0.0001	1240,000.	9	UPJOHN CO.,THE	NORTH
4.24E-02	<1	5.14E-03	4.26E-08	3.52E-07	3.49E-07	309,000	2.82E+00	<0.0001	*****	2	MONSANTO CO	ANNIS
3.97E-02	1,450	5.76E+01	4.78E-04	3.30E-07	1.28E-03	432,000	3.12E+03	0.0004	2,700.	133	BELCHER REF.	MOBIL
3.37E-02	<1	7.62E-03	6.32E-08	2.79E-07	6.12E-07	425,000	4.22E+00	<0.0001	*****	29	AIR PRODUCTS & CHEM.	WICHI
3.14E-02	10	2.98E-01	2.48E-06	2.61E-07	1.85E-05	2,690,000	9.11E+02	0.0001	9,300.	100	ATLANTIC RICHFIELD	HOUST
2.69E-02	7	1.83E-01	1.52E-06	2.23E-07	8.52E-07	2,680,000	4.56E+01	<0.0001	1180,000.	118	KOPPERS	HOUST
2.49E-02	2	4.60E-02	3.82E-07	2.07E-07	4.35E-07	3,100,000	4.77E+01	<0.0001	1180,000.	364	CHEM-CLEAR INC.	BALTI
2.44E-02	<1	4.12E-03	3.42E-08	2.03E-07	4.64E-07	2,540,000	3.63E+01	<0.0001	1230,000.	365	CHEM-CLEAR INC.	CLEVE
2.38E-02	50	1.19E+00	9.86E-06	1.97E-07	6.63E-04	354,000	1.22E+03	0.0001	6,900.	210	HILL PETROLEUM	KROTZ
2.34E-02	175	4.09E+00	3.40E-05	1.94E-07	1.65E-04	60,000	2.46E+02	<0.0001	34,000.	242	GIANT REFINERY	GALLU
1.72E-02	<1	3.93E-05	3.27E-10	1.43E-07	5.97E-07	1,260,000	3.24E+00	<0.0001	*****	41	UNION CARBIDE CORP.	HAHNV
1.70E-02	17	2.96E-01	2.46E-06	1.41E-07	9.45E-07	1,150,000	2.29E+01	<0.0001	1370,000.	376	HERITAGE ENV. SERVIC	INDIA
1.63E-02	<1	4.49E-03	3.73E-08	1.36E-07	4.76E-07	1,730,000	2.68E+00	<0.0001	*****	23	REILLY TAR AND CHEM	GRANI
1.59E-02	<1	7.74E-04	6.43E-09	1.32E-07	2.81E-07	2,240,000	8.58E+00	<0.0001	1980,000.	115	GOODYEAR TIRE & RUBB	LAPOR
1.45E-02	10	1.38E-01	1.14E-06	1.20E-07	6.78E-07	4,250,000	4.13E+01	<0.0001	1200,000.	366	CHEM-MET SERVICES	WYAND
1.40E-02	109	1.52E+00	1.26E-05	1.16E-07	1.86E-04	25,100	3.72E+01	<0.0001	1230,000.	197	FARMLAND FACILITIES	PHILL
1.35E-02	<1	3.07E-03	2.54E-08	1.12E-07	2.46E-07	425,000	1.70E+00	<0.0001	*****	28	ABBOTT LABORATORIES	WICHI
1.24E-02	54	6.73E-01	5.59E-06	1.03E-07	1.70E-07	1,940,000	1.83E+01	<0.0001	1460,000.	382	CECOS INT'L	BRIST
1.08E-02	7	7.05E-02	5.85E-07	8.93E-08	3.39E-07	708,000	5.70E+00	<0.0001	*****	99	AMOCO CHEMICAL	TEXAS
1.01E-02	1	1.05E-02	8.73E-08	8.35E-08	4.39E-07	189,000	8.82E-01	<0.0001	*****	33	GAF CORP.	CALVE
9.22E-03	22	2.03E-01	1.68E-06	7.65E-08	8.77E-04	34,800	5.17E+01	<0.0001	1160,000.	141	TESARO ALASKA PETROL	KENAI
9.10E-03	<1	2.61E-03	2.17E-08	7.55E-08	3.26E-07	6,100,000	1.87E+01	<0.0001	1450,000.	363	CID-LANDFILL	CALUM
7.99E-03	1	8.26E-03	6.86E-08	6.63E-08	2.76E-07	415,000	1.01E+00	<0.0001	*****	85	USS CHEMICAL	IRONT
7.83E-03	1,150	9.03E+00	7.50E-05	6.50E-08	5.07E-04	34,300	8.42E+01	<0.0001	1100,000.	243	NAVAJO REFINING	ARTES
7.61E-03	1	5.00E-03	4.15E-08	6.32E-08	4.47E-07	649,000	2.02E+00	<0.0001	*****	54	MALLINCKRODT CHEM.	RALEI
7.34E-03	845	6.20E+00	5.15E-05	6.09E-08	4.05E-05	158,000	6.31E+01	<0.0001	1130,000.	261	QUAKER STATE OIL REF	SMETH
7.21E-03	28	2.00E-01	1.66E-06	5.99E-08	1.02E-07	1,170,000	7.93E+00	<0.0001	*****	370	FRONTIER CHEMICAL	NIAGR
6.66E-03	360	2.40E+00	1.99E-05	5.53E-08	4.92E-05	76,500	3.49E+01	<0.0001	1240,000.	140	PETRO STAR	NORTH
6.57E-03	1	8.94E-03	7.42E-08	5.45E-08	4.04E-08	328,000	5.82E-01	<0.0001	*****	102	CELANESE CHEMICAL	BISHO
6.55E-03	2	1.38E-02	1.14E-07	5.44E-08	1.26E-07	1,970,000	3.63E+00	<0.0001	*****	81	BF GOODRICH	AVON
6.54E-03	<1	3.30E-04	2.74E-09	5.43E-08	1.77E-07	469,000	8.21E-01	<0.0001	*****	18	NORCHEM CO.	CLINT
6.07E-03	15	8.97E-02	7.44E-07	5.04E-08	1.66E-07	804,000	7.32E+00	<0.0001	*****	1	ALLIED SIGNAL	BIRMI
5.34E-03	491	2.62E+00	1.18E-05	4.43E-08	7.09E-05	221,000	8.44E+01	<0.0001	1100,000.	206	CANAL REF.	CHURC

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TABLE D-4. (continued)

Summary for BENZENE
with a Unit Risk of 8.30E-06

SIC=

CAS=

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- M a x i m u m -

- M i n i m u m -

Conc People Exposure Lifetime
Incidence Max Risk

Conc People Exposure Annual Repeat
Incidence Interval

S o u r c e

4.52E-03	1	3.07E-03	2.54E-08	3.75E-08	4.87E-08	2,000,000	1.12E+00	<0.0001*****	5	DOW CHEMICAL	PITTS
4.06E-03	57	2.32E-01	1.93E-06	3.37E-08	4.16E-06	824,000	4.00E+01	<0.0001210,000.	128	HERCULES	MAGNA
4.04E-03	77	3.11E-01	2.58E-06	3.35E-08	1.35E-06	2,210,000	6.93E+01	<0.0001120,000.	50	MONSANTO CO	ST. L
2.89E-03	1	1.84E-03	1.53E-08	2.40E-08	8.39E-08	113,000	1.44E-01	<0.0001*****	3	GREAT LAKES CHEMICAL	EL DO
2.60E-03	22	5.71E-02	4.74E-07	2.16E-08	2.47E-04	34,800	1.46E+01	<0.0001580,000.	138	CHEVRON	KENAI
2.17E-03	598	1.30E+00	1.08E-05	1.80E-08	2.69E-05	108,000	1.63E+01	<0.0001520,000.	143	BERRY PETROLEUM	STEVE
2.15E-03	11	2.34E-02	1.94E-07	1.79E-08	5.84E-08	902,000	4.91E+00	<0.0001*****	76	EASTMAN KODAK	ROCHE
2.07E-03	4	8.25E-03	6.85E-08	1.71E-08	2.13E-08	2,090,000	2.07E+00	<0.0001*****	361	CHEMICAL PROCESSORS	SEATT
1.93E-03	<1	1.60E-04	1.33E-09	1.60E-08	3.61E-08	200,000	3.89E-02	<0.0001*****	19	CLARK OIL & REFINING	BLUE
1.89E-03	<1	1.35E-04	1.12E-09	1.57E-08	3.28E-08	2,590,000	9.27E-01	<0.0001*****	113	GLIDDEN COATINGS	CARRO
1.84E-03	23	4.24E-02	3.52E-07	1.53E-08	5.04E-05	24,400	6.92E+00	<0.0001*****	250	BARRETT REF.	THOMA
1.81E-03	<1	2.08E-06	1.73E-11	1.50E-08	1.05E-07	362,000	3.08E-01	<0.0001*****	17	OLIN CHEMICALS	AUGUS
1.40E-03	2	2.63E-03	2.19E-08	1.16E-08	4.02E-08	386,000	1.84E-01	<0.0001*****	114	GOODYEAR TIRE	BEAUM
1.36E-03	1	1.74E-03	1.44E-08	1.13E-08	7.05E-08	294,000	1.33E-01	<0.0001*****	25	US INDUSTRIAL CHEM.	TUSCO
1.28E-03	<1	3.87E-04	3.21E-09	1.06E-08	8.93E-08	12,700,000	2.10E+01	<0.0001400,000.	56	AMERICAN CYANAMID CO	LINDE
1.24E-03	10	1.24E-02	1.03E-07	1.03E-08	1.49E-08	13,300,000	8.62E+00	<0.0001980,000.	68	ORBIS PRODUCTS CORP	NEWAR
1.11E-03	14	1.52E-02	1.26E-07	9.25E-09	4.02E-08	435,000	1.17E+00	<0.0001*****	79	ALLIED CHEMICAL	IRONT
9.95E-04	4	4.30E-03	3.57E-08	8.26E-09	4.07E-08	483,000	2.64E-01	<0.0001*****	96	US ARMY MUNITIONS	KINGS
9.48E-04	1	6.16E-04	5.11E-09	7.87E-09	3.47E-07	2,450,000	9.70E+00	<0.0001870,000.	125	UPJOHN CO	LA PO
8.15E-04	33	2.69E-02	2.23E-07	6.76E-09	1.01E-04	6,710	1.93E+00	<0.0001*****	142	INTERMOUNTAIN REF.	FREDO
6.99E-04	22	1.54E-02	1.28E-07	5.80E-09	4.49E-04	252	1.19E-01	<0.0001*****	391	USPCI GRASSY MT.	KNOWL
6.64E-04	1,270	8.46E-01	7.02E-06	5.51E-09	3.28E-07	556,000	6.00E+00	<0.0001*****	40	STAUFFER CHEMICAL	BATON
6.63E-04	601	3.99E-01	3.31E-06	5.50E-09	4.31E-06	357,000	9.51E+00	<0.0001890,000.	356	ENV. ENTERPRISES	CINCI
5.97E-04	<1	1.02E-04	8.45E-10	4.95E-09	8.45E-09	300,000	3.02E-02	<0.0001*****	14	DOW CHEMICAL	DALTO
5.91E-04	36	2.11E-02	1.75E-07	4.90E-09	3.09E-08	415,000	8.74E-01	<0.0001*****	26	MEAD JOHNSON	EVANS
5.61E-04	4	2.27E-03	1.88E-08	4.65E-09	9.27E-07	2,580,000	2.65E+01	<0.0001320,000.	106	DIAMOND SHAMROCK COR	DEER
4.78E-04	170	8.13E-02	6.75E-07	3.97E-09	1.46E-05	206,000	1.89E+01	<0.0001450,000.	379	CASMALIA RESOURCES	CASMA
4.58E-04	5	2.19E-03	1.82E-08	3.80E-09	7.69E-09	12,500,000	1.64E+00	<0.0001*****	358	SOLVENT RECOV. SERVI	LINDE
3.68E-04	38	1.40E-02	1.16E-07	3.05E-09	6.57E-09	613,000	4.08E-01	<0.0001*****	362	CHEMICAL RESOURCES	TULSA
3.44E-04	12	4.00E-03	3.32E-08	2.86E-09	5.91E-09	2,610,000	3.44E-01	<0.0001*****	119	LILLY IND. COATINGS	DALLA
2.85E-04	860	2.45E-01	2.04E-06	2.37E-09	3.08E-06	89,200	2.33E+00	<0.0001*****	378	IT CORPORATION	WESTM
2.59E-04	1,850	4.80E-01	3.98E-06	2.15E-09	2.37E-06	551,000	4.63E+00	<0.0001*****	38	GEORGIA-PACIFIC CORP	PLAQU
2.54E-04	2,170	5.50E-01	4.56E-06	2.11E-09	8.84E-06	281,000	1.74E+01	<0.0001490,000.	13	ATLANTIC WOOD INDUST	SAVAN
2.42E-04	1,980	4.78E-01	3.96E-06	2.01E-09	4.74E-06	180,000	5.53E+00	<0.0001*****	95	RHONE-POULENC, INC.	MT. P
2.37E-04	<1	6.08E-05	5.05E-10	1.96E-09	3.32E-09	573,000	8.30E-02	<0.0001*****	8	DOW CHEMICAL	LEDYA
2.06E-04	24	4.91E-03	4.07E-08	1.71E-09	2.79E-09	5,190,000	2.98E-01	<0.0001*****	55	AMERICAN CYANAMID	BRIDG
1.40E-04	4	6.00E-04	4.98E-09	1.16E-09	6.63E-09	1,780,000	1.66E-01	<0.0001*****	83	PPG INDUSTRIES	NORTO
1.39E-04	<1	3.88E-06	3.22E-11	1.16E-09	6.92E-09	460,000	2.10E-02	<0.0001*****	93	DUPONT	LUGOF
1.31E-04	1	6.70E-05	5.56E-10	1.09E-09	5.58E-09	4,810,000	2.61E-01	<0.0001*****	63	HERCULES	GIBBS
1.28E-04	5	5.99E-04	4.97E-09	1.06E-09	5.67E-09	2,200,000	2.21E-01	<0.0001*****	21	MONSANTO CO	SAUGE
1.22E-04	489	5.94E-03	4.93E-07	1.01E-09	3.49E-05	536	6.11E-02	<0.0001*****	234	NEVADA REF.	TONOP
1.17E-04	5	5.85E-04	4.85E-09	9.72E-10	1.23E-09	1,330,000	1.17E-01	<0.0001*****	351	COMMERCIAL DISPOSAL	WEST
1.14E-04	29	3.31E-03	2.75E-08	9.50E-10	1.36E-09	13,800,000	1.54E+00	<0.0001*****	360	CALLEIA RES. RECOVER	BROOK
1.02E-04	681	6.96E-02	5.77E-07	8.48E-10	8.09E-07	163,000	8.87E-01	<0.0001*****	75	AYERST LABS	ROUSE
8.31E-05	769	6.39E-02	5.31E-07	6.90E-10	1.36E-06	118,000	6.53E-01	<0.0001*****	52	KERR-MCGEE CHEM. COR	MERID

TABLE D-4. (continued)

Summary for BENZENE REFINERIES
with a Unit Risk of 8.30E-06

SIC= CAS=

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- M a x i m u m -					- - M i n i m u m - -							S o u r c e	
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval				
7.45E-05	<1	1.28E-06	1.06E-11	6.18E-10	3.63E-09	3,440,000	6.67E-02	<0.0001*****		396	WAYNE DISPOSAL	BELLE	
7.30E-05	2	1.80E-04	1.49E-09	6.06E-10	2.96E-09	4,570,000	1.09E-01	<0.0001*****		373	ROLLINS ENV. SERVICE	BRIDG	
2.74E-05	1,310	3.58E-02	2.97E-07	2.27E-10	5.73E-07	423,000	1.72E+00	<0.0001*****		392	PEORIA DISPOSAL CO.	PEORI	
2.48E-05	43	1.07E-03	8.86E-09	2.06E-10	1.07E-07	87,400	2.25E-01	<0.0001*****		123	UNION CARBIDE	SEADR	
6.62E-06	203	1.34E-03	1.12E-08	5.49E-11	8.13E-08	552,000	2.07E-01	<0.0001*****		37	ETHYL CORP.	BATON	
1.00E-38		0.00E+00	0.00E+00	0.00E+00	1.00E+38		0.00E+00			130	ALDRICH CHEMICALS	MILWA	
1.00E-38		0.00E+00	0.00E+00	0.00E+00	1.00E+38		0.00E+00			136	ARCO ALASKA	KUPAR	
					701,000,000 8.85E+06 1.0 0.95					O v e r a l l			

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TABLE D-5. HEM RESULTS FOR CASE 3 (CONTROLLED MINIMUM)

Summary for BENZENE with a Unit Risk of 8.30E-06					SIC=	CAS=						Page 1 of 9	
- M a x i m u m -					- - M i n i m u m - -								
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval	S o u r c e			
4.40E+00	<1	7.95E-02	6.60E-07	3.65E-05	4.03E-05	249,000	4.89E+02	0.0001	17,000.	110	EASTMAN KODAK, INC.	LONGV	
3.79E+00	<1	9.56E-02	7.94E-07	3.15E-05	1.30E-04	137,000	7.05E+02	0.0001	12,000.	107	DOW CHEMICAL USA	FREEP	
3.59E+00	21	7.62E+01	6.32E-04	2.98E-05	2.09E-05	382,000	1.45E+03	0.0002	5,800.	397	TEXAS ECOLOGISTS	ROBST	
2.84E+00	112	3.18E+02	2.64E-03	2.36E-05	8.87E-04	2,030,000	1.94E+04	0.0023	430.	98	AMERICAN ROECHST COR	HOUST	
2.70E+00	1	3.45E+00	2.86E-05	2.24E-05	9.01E-05	1,380,000	6.19E+02	0.0001	14,000.	387	CECOS INT'L	WILLI	
2.48E+00	<1	1.17E+00	9.73E-06	2.06E-05	7.82E-05	695,000	9.63E+02	0.0001	8,800.	266	AMOCO	TEXAS	
2.23E+00	3	5.70E+00	4.73E-05	1.85E-05	1.45E-05	893,000	5.75E+02	0.0001	15,000.	91	UNION CARBIDE	PENUE	
2.22E+00	18	3.96E+01	3.29E-04	1.84E-05	7.95E-05	556,000	2.39E+03	0.0003	3,500.	209	EXXON CORP	BATON	
2.18E+00	7	1.61E+01	1.34E-04	1.81E-05	1.14E-04	1,170,000	2.94E+03	0.0003	2,900.	27	REILLY TAR AND CHEMI	INDIA	
2.06E+00	<1	9.92E-02	8.23E-07	1.71E-05	4.05E-05	2,590,000	1.46E+03	0.0002	5,800.	290	SHELL OIL	DEER	
1.94E+00	<1	3.87E-01	3.21E-06	1.61E-05	8.24E-05	1,140,000	5.63E+02	0.0001	15,000.	218	BP OIL	BELLE	
1.77E+00	1	1.14E+00	9.47E-06	1.47E-05	1.49E-05	102,000	8.65E+01	<0.0001	97,000.	126	WITCO CHEMICAL CORPO	POINT	
1.72E+00	3	5.91E+00	4.90E-05	1.43E-05	6.22E-05	4,750,000	1.70E+03	0.0002	5,000.	394	WASTE CONVERSION	HATFI	
1.70E+00	<1	3.39E-01	2.81E-06	1.41E-05	1.55E-05	125,000	3.36E+01	<0.0001	250,000.	304	ARCO PETROLEUM	FERN	
1.68E+00	<1	3.58E-01	2.97E-06	1.39E-05	5.86E-05	382,000	4.07E+02	<0.0001	21,000.	352	ASHLAND CHEMICAL	BOYD	
1.61E+00	1	1.49E+00	1.24E-05	1.34E-05	5.39E-05	228,000	2.37E+02	<0.0001	36,000.	207	CITGO PETROLEUM	LAKE	
1.57E+00	4	6.76E+00	5.61E-05	1.31E-05	2.90E-05	10,500,000	3.46E+03	0.0004	2,400.	64	INT'L FLAVORS & FRAG	UNION	
1.54E+00	1	1.56E+00	1.30E-05	1.28E-05	2.65E-05	361,000	1.06E+02	<0.0001	79,000.	132	MOBAY CHEMICAL CORP	NEW M	
1.50E+00	10	1.49E+01	1.24E-04	1.25E-05	5.18E-05	5,420,000	3.30E+03	0.0004	2,600.	190	AMOCO CHEMICAL	WHITI	
1.48E+00	111	1.65E+02	1.37E-03	1.23E-05	2.40E-05	8,090,000	4.96E+03	0.0006	1,700.	169	SHELL OIL	WILMI	
1.46E+00	11	1.64E+01	1.36E-04	1.22E-05	3.82E-05	7,970,000	3.33E+03	0.0004	2,500.	149	CHEVRON	EL SE	
1.43E+00	1	9.66E-01	8.02E-06	1.19E-05	4.96E-05	397,000	4.94E+02	0.0001	17,000.	286	MOBIL OIL	BEAUM	
1.42E+00	2	3.01E+00	2.50E-05	1.18E-05	4.30E-05	3,070,000	1.27E+03	0.0002	6,600.	150	CHEVRON	RICHM	
1.37E+00	3	3.71E+00	3.08E-05	1.13E-05	1.10E-05	859,000	5.02E+02	0.0001	17,000.	77	GENERAL ELECTRIC	WATER	
1.34E+00	<1	1.39E-01	1.15E-06	1.11E-05	9.02E-06	339,000	5.94E+02	0.0001	14,000.	267	CHAMPLIN PETROLEUM C	CORPU	
1.30E+00	6	7.92E+00	6.58E-05	1.08E-05	2.33E-05	327,000	1.17E+03	0.0001	7,200.	7	WITCO CORP.	OILDA	
1.27E+00	17	2.10E+01	1.75E-04	1.05E-05	3.40E-05	8,460,000	3.22E+03	0.0004	2,600.	161	MOBIL OIL	TORRA	
1.23E+00	1	1.28E+00	1.06E-05	1.02E-05	4.27E-05	415,000	1.56E+02	<0.0001	54,000.	80	ARIS TECH CHEMICAL	HAVER	
1.22E+00	1	1.35E+00	1.12E-05	1.02E-05	7.74E-06	344,000	3.92E+02	<0.0001	22,000.	270	COASTAL REFINING	CORPU	
1.15E+00	4	4.31E+00	3.58E-05	9.56E-06	2.83E-05	2,920,000	8.15E+02	0.0001	10,000.	176	UNION OIL OF CALIFOR	RODEO	
1.15E+00	<1	5.12E-01	4.25E-06	9.53E-06	6.68E-06	364,000	1.37E+02	<0.0001	61,000.	281	KOCH INDUSTRIES	CORPU	
1.13E+00	17	1.94E+01	1.61E-04	9.36E-06	2.06E-05	2,790,000	4.29E+03	0.0005	2,000.	44	FMC CORP.	BALTI	
1.11E+00	4	4.33E+00	3.60E-05	9.24E-06	1.83E-05	8,070,000	2.45E+03	0.0003	3,400.	172	TEXACO REFINING	WILMI	
1.07E+00	97	1.04E+02	8.61E-04	8.91E-06	3.61E-05	333,000	1.21E+03	0.0001	7,000.	247	STANDARD OIL OF OHIO	LIMA	
1.07E+00	<1	1.36E-01	1.13E-06	8.90E-06	6.12E-05	1,190,000	2.13E+03	0.0003	4,000.	214	MOBIL	CHALM	
1.06E+00	1	9.22E-01	7.65E-06	8.79E-06	1.93E-05	207,000	7.42E+01	<0.0001	110,000.	260	PENNZOIL COMPANY	ROUSE	
1.04E+00	<1	1.17E-01	9.68E-07	8.65E-06	4.10E-05	359,000	2.58E+02	<0.0001	33,000.	293	STAR REF.	PORT	
1.04E+00	<1	3.59E-01	2.98E-06	8.61E-06	3.71E-05	377,000	2.89E+02	<0.0001	29,000.	201	ASHLAND PETROLEUM CO	ASHLA	
1.03E+00	1	8.64E-01	7.17E-06	8.58E-06	8.19E-06	228,000	4.74E+01	<0.0001	180,000.	309	TEXACO USA	ANACO	
1.02E+00	13	1.37E+01	1.14E-04	8.48E-06	1.07E-06	1,060,000	6.15E+02	0.0001	14,000.	280	HOWELL HYDROCARBONS	SAN A	
9.96E-01	1	8.20E-01	5.80E-06	8.27E-06	2.39E-05	392,000	1.70E+02	<0.0001	50,000.	108	DUPONT	BEAUM	
9.85E-01	1	9.01E-01	7.48E-06	8.17E-06	1.97E-05	2,670,000	8.47E+02	0.0001	10,000.	271	CROWN CENTRAL	HOUST	
9.51E-01	13	1.24E+01	1.03E-04	7.89E-06	1.93E-05	2,690,000	1.03E+03	0.0001	8,200.	359	ERIEWAY POLL. CONTRO	BEDFO	
9.37E-01	2	1.63E+00	1.35E-05	7.77E-06	3.62E-05	720,000	1.80E+02	<0.0001	47,000.	213	MARATHON PETROLEUM	GARYV	
9.25E-01	<1	1.10E-01	3.12E-07	7.68E-06	3.26E-05	1,900,000	4.62E+02	0.0001	18,000.	224	KOCH REFINING	ROSEM	

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TABLE D-5. (continued)

Summary for BENZENE REFINERIES
with a Unit Risk of 8.30E-06

SIC= CAS=

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- M a x i m u m -					- - M i n i m u m - -					Annual Repeat		S o u r c e
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Incidence	Interval			
8.89E-01	2	2.05E+00	1.70E-05	7.38E-06	2.72E-05	225,000	2.41E+02	<0.0001	35,000.	208	CONOCO CHEMICALS	WESTL
8.73E-01	1	7.99E-01	6.63E-06	7.24E-06	2.41E-05	171,000	4.20E+01	<0.0001	200,000.	288	PHILLIPS	SWEEN
8.60E-01	2	1.83E+00	1.52E-05	7.14E-06	2.66E-05	4,560,000	9.87E+02	0.0001	8,500.	57	ATLANTIC WOOD INDUST	HAINA
8.55E-01	4,530	3.88E+03	3.22E-02	7.10E-06	6.83E-04	2,380,000	2.40E+04	0.0028	350.	97	AMERICAN HOECHST COR	PASAD
8.49E-01	2	1.48E+00	1.23E-05	7.05E-06	1.30E-05	61,000	5.15E+01	<0.0001	160,000.	241	BLOOMFIELD REFINING	BLOOM
8.29E-01	<1	9.79E-02	8.12E-07	6.88E-06	2.90E-05	1,510,000	2.56E+02	<0.0001	33,000.	187	MOBIL OIL	JOLIE
8.09E-01	<1	3.85E-02	3.19E-07	6.72E-06	3.32E-05	2,060,000	4.95E+02	0.0001	17,000.	188	SHELL OIL	WOOD
8.04E-01	<1	3.21E-01	2.66E-06	6.67E-06	2.07E-05	857,000	1.07E+02	<0.0001	79,000.	121	MONSANTO CO	ALVIN
7.99E-01	46	3.67E+01	3.04E-04	6.63E-06	5.28E-06	338,000	7.86E+02	0.0001	11,000.	292	SOUTHWESTERN REFININ	CORPU
7.83E-01	9	6.89E+00	5.72E-05	6.50E-06	1.11E-05	12,700,000	3.19E+03	0.0004	2,600.	238	EXXON	LINDE
7.80E-01	1	5.00E-01	4.15E-06	6.47E-06	2.41E-05	1,270,000	1.83E+02	<0.0001	46,000.	217	SHELL CHEM CO	NORCO
7.74E-01	6	4.39E+00	3.65E-05	6.42E-06	1.33E-05	7,880,000	1.47E+03	0.0002	5,800.	174	UNION OIL OF CALIFOR	WILMI
7.63E-01	1	7.43E-01	6.17E-06	6.33E-06	1.33E-05	300,000	7.48E+01	<0.0001	110,000.	380	IT CORP.-PETROL. WAS	BUTTO
7.58E-01	37	2.82E+01	2.34E-04	6.29E-06	2.73E-05	1,190,000	2.07E+03	0.0002	4,100.	369	ECOLOTEC	DAYTO
7.44E-01	10	7.63E+00	6.33E-05	6.17E-06	1.70E-05	4,530,000	6.37E+02	0.0001	13,000.	162	NEWHALL REFINING CO.	NEWHA
7.15E-01	13	9.58E+00	7.95E-05	5.94E-06	1.36E-05	2,590,000	1.17E+03	0.0001	7,200.	341	LTV STEEL	CLEVE
7.07E-01	2	1.11E+00	9.19E-06	5.87E-06	2.01E-05	2,110,000	3.61E+02	<0.0001	23,000.	398	DELAWARE CONTAINERS	COATS
6.93E-01	<1	3.98E-03	3.30E-08	5.75E-06	5.06E-06	230,000	2.37E+01	<0.0001	360,000.	306	SHELL OIL	ANACO
6.91E-01	1	8.08E-01	6.70E-06	5.73E-06	3.11E-05	159,000	1.61E+02	<0.0001	52,000.	186	MARATHON PETROLEUM	ROBIN
6.85E-01	2	1.48E+00	1.23E-05	5.68E-06	6.29E-06	335,000	2.25E+02	<0.0001	37,000.	323	GULF STATES	GADSD
6.84E-01	18	1.20E+01	9.98E-05	5.68E-06	2.41E-05	6,550,000	1.28E+03	0.0002	6,600.	189	UNION OIL OF CALIFOR	LEMON
6.81E-01	42	2.83E+01	2.35E-04	5.65E-06	2.61E-05	2,310,000	1.89E+03	0.0002	4,500.	343	LTV STEEL COMPANY	PITTS
6.76E-01	13	8.51E+00	7.07E-05	5.61E-06	2.66E-05	4,840,000	1.99E+03	0.0002	4,200.	237	COASTAL EAGLE PT.	WESTV
6.73E-01	1	3.76E-01	3.12E-06	5.58E-06	1.94E-05	388,000	1.80E+02	<0.0001	47,000.	295	UNION OIL OF CALIFOR	NEDER
6.70E-01	33	2.19E+01	1.82E-04	5.56E-06	3.27E-05	817,000	9.36E+02	0.0001	9,000.	249	SUN CO.	TOLED
6.63E-01	<1	2.58E-01	2.14E-06	5.50E-06	2.12E-05	551,000	9.56E+01	<0.0001	88,000.	36	DOW CHEMICAL	PLAQU
6.61E-01	<1	4.53E-02	3.76E-07	5.48E-06	1.28E-05	3,080,000	3.46E+02	<0.0001	24,000.	45	VISTA CHEMICAL	BALTI
6.48E-01	21	1.38E+01	1.14E-04	5.38E-06	2.54E-05	4,450,000	1.26E+03	0.0001	6,700.	263	SUN PETROLEUM	MARCU
6.42E-01	1	5.30E-01	4.40E-06	5.33E-06	1.09E-05	725,000	1.79E+02	<0.0001	47,000.	348	U.S. STEEL CORP.	PROVO
6.36E-01	<1	2.25E-01	1.87E-06	5.28E-06	1.03E-05	929,000	2.80E+02	<0.0001	30,000.	300	CRYSEN REFINING	WOODS
6.15E-01	<1	1.55E-02	1.29E-07	5.10E-06	2.17E-05	5,490,000	5.83E+02	0.0001	14,000.	330	INLAND STEEL	E CHI
6.13E-01	207	1.27E+02	1.05E-03	5.08E-06	1.74E-05	8,640,000	3.73E+03	0.0004	2,300.	175	UNOCAL	LOS A
6.10E-01	6	3.81E+00	3.18E-05	5.06E-06	1.22E-05	325,000	6.82E+02	0.0001	12,000.	159	KERN OIL & REFINING	BAKER
5.95E-01	<1	8.83E-03	7.33E-08	4.93E-06	2.85E-05	3,380,000	5.33E+02	0.0001	16,000.	388	MICHIGAN DISPOSAL IN	BELLE
5.69E-01	28	1.61E+01	1.34E-04	4.72E-06	1.51E-05	1,160,000	8.98E+02	0.0001	9,400.	342	BETHLEHEM STEEL CORP	BETHL
5.57E-01	<1	4.58E-02	3.80E-07	4.63E-06	3.29E-05	326,000	1.37E+02	<0.0001	62,000.	191	INDIANA FARM BUREAU	MT. V
5.51E-01	22	1.21E+01	1.00E-04	4.57E-06	1.93E-05	2,190,000	6.51E+02	0.0001	13,000.	338	ARMCO INC	MIDDL
5.42E-01	18	9.56E+00	7.93E-05	4.50E-06	2.25E-05	52,700	3.40E+02	<0.0001	25,000.	103	CELANESE CORP.	PAMPA
5.39E-01	<1	9.40E-02	7.80E-07	4.48E-06	6.89E-06	1,760,000	2.14E+02	<0.0001	39,000.	308	SOUND REF.	TACOM
5.30E-01	<1	2.19E-01	1.82E-06	4.40E-06	4.13E-06	151,000	1.56E+01	<0.0001	540,000.	307	SOHIO	FERND
5.28E-01	3	1.35E+00	1.12E-05	4.38E-06	3.44E-06	893,000	1.36E+02	<0.0001	62,000.	92	UNION CARBIDE CARIBE	PONCE
5.00E-01	4	1.89E-01	1.57E-05	4.15E-06	1.08E-05	197,000	8.03E+01	<0.0001	110,000.	259	WITCO CHEMICAL CORP.	BRADF
4.94E-01	<1	8.10E-01	6.72E-08	4.10E-06	1.93E-05	1,400,000	1.82E+02	<0.0001	46,000.	179	STAR REF.	DELA
4.74E-01	<1	1.32E-01	1.09E-07	3.94E-06	7.94E-06	925,000	2.04E+02	<0.0001	41,000.	393	PETROCHEM RECYCLING	SALT
4.71E-01	1	3.89E-01	3.23E-06	3.91E-06	2.42E-05	1,030,000	2.98E+02	<0.0001	28,000.	349	WHEELING PITT	E STE

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TABLE D-5. (continued)

Summary for BENZENE REFINERIES
with a Unit Risk of 8.30E-06

SIC= CAS=

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- M a x i m u m -					- - M i n i m u m - -					S o u r c e	
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval		
4.69E-01	1	6.85E-01	5.69E-06	3.90E-06	2.26E-05	838,000	2.35E+02	<0.0001	36,000.	248	STANDARD OIL OF OHIO TOLED
4.33E-01	27	1.18E+01	9.76E-05	3.59E-06	1.66E-05	4,440,000	1.03E+03	0.0001	8,200.	262	BP OIL MARCU
4.08E-01	71	2.88E+01	2.39E-04	3.38E-06	6.35E-06	8,200,000	1.40E+03	0.0002	6,000.	148	CHEMOIL SIGNA
4.08E-01	<1	3.18E-02	2.64E-07	3.38E-06	1.64E-05	3,430,000	4.07E+02	<0.0001	21,000.	62	DUPONT DEEPW
3.96E-01	<1	9.02E-02	7.49E-07	3.29E-06	7.52E-06	30,900	6.22E+00	<0.0001	*****	301	PENNZOIL ROOSE
3.93E-01	<1	1.23E-01	1.02E-06	3.26E-06	1.63E-05	4,830,000	8.05E+02	0.0001	10,000.	240	MOBIL OIL PAULS
3.92E-01	1	4.76E-01	3.95E-06	3.25E-06	7.63E-06	325,000	2.17E+02	<0.0001	39,000.	170	SUNLAND REF. BAKER
3.89E-01	<1	9.38E-03	7.78E-08	3.23E-06	7.21E-06	379,000	3.91E+01	<0.0001	220,000.	199	TEXACO REFINING EL DO
3.89E-01	89	3.46E+01	2.87E-04	3.22E-06	1.27E-05	2,680,000	7.98E+02	0.0001	11,000.	278	HILL PETROLEUM HOUST
3.87E-01	<1	1.11E-01	9.23E-07	3.21E-06	1.39E-05	6,100,000	7.95E+02	0.0001	11,000.	368	CHEM. WASTE MGMT. CALUM
3.85E-01	3	1.12E+00	9.30E-06	3.19E-06	6.67E-06	134,000	7.15E+01	<0.0001	120,000.	196	FARMLAND INDUSTRIES COPPE
3.59E-01	1	5.04E-01	4.19E-06	2.98E-06	1.84E-05	927,000	1.47E+02	<0.0001	57,000.	312	QUAKER STATE OIL REF NEWEL
3.59E-01	18	6.30E+00	5.23E-05	2.98E-06	2.15E-05	1,190,000	7.01E+02	0.0001	12,000.	215	MURPHY OIL CORPORATI MERAU
3.52E-01	49	1.72E+01	1.43E-04	2.92E-06	1.29E-05	1,670,000	9.11E+02	0.0001	9,300.	383	CECOS INT'L CINCI
3.43E-01	<1	1.77E-02	1.47E-07	2.85E-06	1.35E-05	1,220,000	1.02E+02	<0.0001	83,000.	10	STANDARD CHLORIDE CH DELAW
3.27E-01	3	1.13E+00	9.41E-06	2.72E-06	5.93E-06	147,000	6.71E+01	<0.0001	130,000.	198	NATIONAL COOPERATIVE MCPHE
3.24E-01	16	5.24E+00	4.35E-05	2.69E-06	2.27E-06	1,230,000	8.58E+01	<0.0001	98,000.	4	ALPHA RESINS PERRI
3.23E-01	13	4.26E+00	3.53E-05	2.68E-06	1.18E-05	697,000	2.06E+02	<0.0001	41,000.	279	HILL PETROLEUM TEXAS
3.21E-01	1	4.63E-01	3.84E-06	2.67E-06	1.88E-05	707,000	2.10E+02	<0.0001	40,000.	47	PARKE-DAVIS HOLLA
3.21E-01	44	1.42E+01	1.18E-04	2.67E-06	1.25E-05	4,900,000	2.08E+03	0.0002	4,100.	257	ATLANTIC REFINING PHILA
3.20E-01	1	2.60E-01	2.16E-06	2.66E-06	4.77E-05	2,450,000	1.12E+03	0.0001	7,500.	284	LYONDELL PETROCHEMIC HOUST
3.16E-01	<1	5.56E-01	4.61E-08	2.62E-06	8.20E-06	763,000	5.18E+01	<0.0001	160,000.	183	HAWAII INDEP. REF. EWA B
3.15E-01	1	3.83E-01	3.18E-06	2.62E-06	6.14E-06	325,000	1.74E+02	<0.0001	48,000.	167	SAN JOAQUIN REF. BAKER
3.14E-01	<1	1.27E-01	1.05E-06	2.60E-06	6.04E-06	126,000	1.04E+01	<0.0001	1810,000.	229	SOUTHLAND OIL SANDE
3.07E-01	65	2.00E+01	1.66E-04	2.55E-06	5.22E-06	1,310,000	7.87E+02	0.0001	11,000.	256	CHEVRON PORTL
3.05E-01	1	2.63E-01	2.18E-06	2.53E-06	2.57E-06	259,000	7.14E+01	<0.0001	120,000.	282	LA GLORIA OIL AND GA TYLER
3.04E-01	<1	1.02E-01	8.50E-07	2.53E-06	3.48E-06	17,500	3.30E+00	<0.0001	*****	317	SINCLAIR OIL SINCL
3.04E-01	<1	1.26E-02	1.04E-07	2.53E-06	8.94E-06	346,000	2.08E+01	<0.0001	410,000.	355	HANSBROUGH ENERGY CROWL
3.01E-01	4	1.22E+00	1.01E-05	2.50E-06	2.74E-06	88,000	3.19E+01	<0.0001	260,000.	255	TOTAL PETROLEUM ARDMO
2.91E-01	3	7.77E-01	6.45E-06	2.41E-06	1.74E-05	9,580	3.31E+01	<0.0001	250,000.	318	WYOMING REF. NEWCA
2.91E-01	1	1.64E-01	1.36E-06	2.41E-06	8.67E-06	772,000	1.37E+02	<0.0001	62,000.	124	UNION CARBIDE CORP TEXAS
2.78E-01	1	1.85E-01	1.53E-06	2.30E-06	1.13E-05	110,000	1.51E+02	<0.0001	56,000.	227	ERGON REF. VICKS
2.73E-01	3	7.10E-01	5.90E-06	2.27E-06	3.28E-06	810,000	1.95E+02	<0.0001	43,000.	320	ABC COKE TARRA
2.72E-01	44	1.20E+01	9.99E-05	2.26E-06	1.79E-05	424,000	2.58E+02	<0.0001	33,000.	332	ARMCO INC. ASHLA
2.69E-01	1	2.94E-01	2.44E-06	2.24E-06	1.20E-05	55,300	2.34E+01	<0.0001	360,000.	287	PHILLIPS 66 REFINERY BORGE
2.68E-01	<1	2.29E-02	1.90E-07	2.22E-06	7.49E-06	574,000	3.42E+01	<0.0001	250,000.	39	RUBICON CHEMICALS IN GEISM
2.65E-01	2	5.77E-01	4.79E-06	2.20E-06	1.57E-06	358,000	4.40E+01	<0.0001	190,000.	296	VALERO ENERGY CORP. CORPU
2.62E-01	<1	4.61E-01	3.82E-08	2.17E-06	6.79E-06	763,000	4.30E+01	<0.0001	200,000.	182	CHEVRON HONOL
2.59E-01	7	1.70E+00	1.41E-05	2.15E-06	8.67E-06	676,000	1.36E+02	<0.0001	62,000.	285	MARATHON OIL TEXAS
2.56E-01	<1	3.86E-01	3.20E-08	2.12E-06	1.02E-05	4,450,000	4.11E+02	<0.0001	21,000.	67	MONSANTO CO BRIDG
2.49E-01	<1	4.49E-01	3.72E-07	2.07E-06	4.77E-06	192,000	1.70E+01	<0.0001	500,000.	264	UNITED REF. WARRE
2.47E-01	6	1.51E+00	1.25E-05	2.05E-06	1.05E-05	2,090,000	1.71E+02	<0.0001	49,000.	185	CLARK OIL & REF. HARTF
2.46E-01	50	1.22E+00	1.01E-04	2.04E-06	5.09E-06	83,000	2.97E+02	<0.0001	28,000.	233	MONTANA REFINING COM GREAT
2.46E-01	2	3.78E-01	3.14E-06	2.04E-06	1.06E-05	971,000	6.41E+01	<0.0001	130,000.	303	AMOCO OIL REFINERY YORKT
2.45E-01	10	2.48E-01	2.06E-05	2.03E-06	1.26E-05	2,070,000	2.17E+02	<0.0001	39,000.	87	ATLANTIC RICHFIELD C MONAC

TABLE D-5. (continued)

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Summary for BENZENE
with a Unit Risk of 8.30E-06

SIC= CAS=

- M a x i m u m -

- - M i n i m u m - -

Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval	S o u r c e
2.45E-01	3	8.41E-01	6.98E-06	2.03E-06	1.19E-05	234,000	3.51E+01	<0.0001240,000.		311 MIDATLANTIC REF. ST. M
2.38E-01	<1	9.25E-02	7.68E-07	1.98E-06	1.89E-06	34,700	1.03E+01	<0.0001820,000.		273 DIAMOND SHAMROCK REF THREE
2.34E-01	28	6.50E+00	5.39E-05	1.94E-06	2.41E-04	455,000	8.60E+02	0.0001 9,800.		74 MONTROSE CHEMICAL CO HENDE
2.33E-01	1	2.31E-01	1.91E-06	1.93E-06	8.17E-06	209,000	2.58E+01	<0.0001330,000.		151 CONOCO SANTA
2.32E-01	1	1.55E-01	1.29E-06	1.92E-06	7.28E-06	511,000	9.04E+01	<0.0001 93,000.		46 DOW CORNING MIDLA
2.27E-01	1	2.43E-01	2.02E-06	1.88E-06	3.06E-06	3,220,000	1.03E+02	<0.0001 82,000.		164 PACIFIC REF. HERCU
2.26E-01	1	1.33E-01	1.10E-06	1.88E-06	6.22E-06	278,000	9.36E+00	<0.0001900,000.		20 GOODRICH, (B.F.) HENRY
2.25E-01	1	2.74E-01	2.27E-06	1.87E-06	4.39E-06	325,000	1.25E+02	<0.0001 68,000.		171 TEXACO REFINING BAKER
2.25E-01	<1	7.48E-02	6.21E-07	1.87E-06	6.82E-06	790,000	1.30E+02	<0.0001 65,000.		322 KOPPERS WOODW
2.22E-01	15	3.27E+00	2.71E-05	1.84E-06	3.63E-06	625,000	1.44E+02	<0.0001 59,000.		253 SINCLAIR OIL TULSA
2.18E-01	1	1.39E-01	1.15E-06	1.81E-06	5.25E-06	1,640,000	1.42E+02	<0.0001 59,000.		178 CONOCO COMME
2.12E-01	<1	3.69E-02	3.06E-07	1.76E-06	2.70E-06	1,760,000	8.39E+01	<0.0001100,000.		310 U.S. OIL & REFINING TACOM
2.10E-01	12	2.49E+00	2.07E-05	1.74E-06	2.59E-06	11,600,000	6.58E+02	0.0001 13,000.		236 CHEVRON PERTH
2.10E-01	<1	1.14E-02	9.48E-08	1.74E-06	3.67E-06	75,300	7.13E+01	<0.0001120,000.		314 AMOCO CASPE
2.08E-01	1	1.09E-01	9.04E-07	1.73E-06	2.20E-06	92,200	6.35E+00	<0.0001*****		252 KERR MCGEE WYNNE
2.07E-01	3	6.25E-01	5.19E-06	1.72E-06	2.65E-05	364,000	1.58E+02	<0.0001 53,000.		277 FINA OIL & CHEMICAL PORT
2.06E-01	<1	8.93E-02	7.41E-07	1.71E-06	7.83E-06	38,900	6.95E+00	<0.0001*****		276 FINA OIL BIG S
2.00E-01	28	5.51E+00	4.58E-05	1.66E-06	4.96E-06	92,800	1.30E+02	<0.0001 65,000.		145 LION OIL EL DO
1.99E-01	5	1.06E+00	8.83E-06	1.65E-06	7.06E-06	6,360,000	6.90E+02	0.0001 12,000.		184 CLARK OIL & REFINING BLUE
1.99E-01	6	1.23E+00	1.02E-05	1.65E-06	7.12E-06	6,100,000	4.45E+02	0.0001 19,000.		327 LTV STEEL S CHI
1.99E-01	2	4.10E-01	3.40E-06	1.65E-06	6.11E-06	225,000	5.59E+01	<0.0001150,000.		204 CALCASIEU REFINING LAKE
1.97E-01	14	2.83E+00	2.35E-05	1.64E-06	3.17E-06	921,000	1.37E+02	<0.0001 62,000.		297 AMOCO OIL REFINERY SALT
1.95E-01	<1	2.99E-02	2.48E-07	1.62E-06	4.11E-06	4,900,000	1.98E+02	<0.0001 43,000.		58 BASF WYANDOTTE CORP. JAMES
1.95E-01	13	2.51E+00	2.08E-05	1.62E-06	7.24E-06	1,970,000	1.86E+02	<0.0001 45,000.		319 ASHLAND PETROLEUM ST. P
1.95E-01	54	1.05E+01	8.75E-05	1.61E-06	6.95E-06	6,210,000	7.09E+02	0.0001 12,000.		326 ACME STEEL CHICA
1.92E-01	17	3.32E+00	2.76E-05	1.59E-06	8.27E-06	2,180,000	2.91E+02	<0.0001 29,000.		325 NATIONAL STEEL GRANI
1.92E-01	4	6.79E-01	5.63E-06	1.59E-06	8.88E-06	3,810,000	2.91E+02	<0.0001 29,000.		222 MARATHON PET. DETRO
1.85E-01	6	1.13E+00	9.34E-06	1.54E-06	3.31E-06	327,000	1.67E+02	<0.0001 51,000.		155 WITCO CORP. OILDA
1.84E-01	1	1.04E-01	8.65E-07	1.53E-06	8.26E-06	1,150,000	1.43E+02	<0.0001 59,000.		129 ATLANTIC WOOD INDUST PORTS
1.80E-01	40	7.23E+00	1.00E-05	1.50E-06	5.33E-06	8,530,000	8.57E+02	0.0001 9,800.		160 LUNDAY-THAGARD CO. SOUTH
1.80E-01	<1	8.43E-02	7.00E-07	1.49E-06	8.20E-06	1,000,000	1.17E+02	<0.0001 72,000.		337 LTV STEEL WARRE
1.80E-01	105	1.89E+01	1.57E-04	1.49E-06	2.64E-06	8,550,000	7.38E+02	0.0001 11,000.		165 PARAMOUNT PET. PARAM
1.77E-01	2	2.74E-01	2.28E-06	1.47E-06	6.33E-06	4,400,000	1.56E+02	<0.0001 54,000.		331 U.S. STEEL CORP. GARY
1.77E-01	<1	1.31E-02	1.09E-07	1.47E-06	5.15E-06	154,000	6.88E+00	<0.0001*****		225 AMERADA HESS PURVI
1.76E-01	1	1.96E-01	1.63E-06	1.46E-06	3.83E-06	248,000	9.10E+00	<0.0001930,000.		212 KERR-MCGEE REFINING COTTO
1.72E-01	1	1.68E-01	1.39E-06	1.43E-06	4.04E-06	1,270,000	5.25E+01	<0.0001160,000.		71 SOUTHLAND CORP. GREAT
1.72E-01	<1	4.63E-02	3.85E-08	1.42E-06	3.64E-06	230,000	5.17E+00	<0.0001*****		146 ANCHOR REF. MCKIT
1.67E-01	14	2.27E+00	1.89E-05	1.39E-06	2.67E-06	12,200,000	5.75E+02	0.0001 15,000.		235 AMERADA-HESS PORT
1.67E-01	54	8.95E+00	7.43E-05	1.39E-06	4.56E-06	562,000	2.03E+02	<0.0001 41,000.		334 NATIONAL STEEL GROUP ECORS
1.66E-01	48	8.04E+00	6.67E-05	1.38E-06	7.54E-06	2,760,000	2.70E+02	<0.0001 31,000.		153 EXXON BENIC
1.65E-01	2	3.61E-01	3.00E-06	1.37E-06	4.46E-06	555,000	5.77E+01	<0.0001150,000.		216 PLACID REFINING PORT
1.65E-01	2	3.31E-01	2.74E-06	1.37E-06	7.52E-06	166,000	3.02E+01	<0.0001280,000.		202 SOMERSET REFINERY SOMER
1.63E-01	25	3.99E+00	3.31E-05	1.35E-06	1.04E-05	494,000	2.29E+02	<0.0001 37,000.		268 CHEVRON EL PA
1.62E-01	15	2.42E+00	2.01E-05	1.35E-06	8.35E-06	2,410,000	4.49E+02	0.0001 19,000.		345 SHENANGO SHENA
1.57E-01	4	6.31E-01	5.24E-06	1.30E-06	3.10E-06	8,320,000	3.98E+02	<0.0001 21,000.		72 STAUFFER CHEMICAL CO EDISO

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TABLE D-5. (continued)

Summary for BENZENE REFINERIES
with a Unit Risk of 8.30E-06

SIC=

CAS=

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- M a x i m u m -					- - M i n i m u m - - -					Annual Repeat		S o u r c e
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Incidence	Interval			
1.56E-01	30	4.72E+00	3.91E-05	1.30E-06	2.66E-06	8,170,000	4.38E+02	0.0001	19,000.	154	FLETCHER OIL & REFIN	WILMI
1.56E-01	111	1.73E+01	1.43E-04	1.29E-06	2.52E-06	8,090,000	5.20E+02	0.0001	16,000.	158	HUNTWAY REF.	WILMI
1.53E-01	36	5.52E+00	4.58E-05	1.27E-06	2.31E-06	8,630,000	5.91E+02	0.0001	14,000.	152	EDGINGTON OIL COMPAN	LONG
1.53E-01	1	8.15E-02	6.76E-07	1.27E-06	2.72E-06	110,000	1.15E+01	<0.0001	730,000.	200	TOTAL PETROLEUM	ARKAN
1.52E-01	4	6.06E-01	5.03E-06	1.26E-06	1.57E-06	2,090,000	1.52E+02	<0.0001	56,000.	305	CHEVRON	SEATT
1.50E-01	34	5.05E+00	4.19E-05	1.25E-06	3.90E-06	381,000	1.75E+02	<0.0001	48,000.	203	PENNZOIL	SHREV
1.49E-01	<1	8.11E-03	6.73E-08	1.24E-06	2.61E-06	75,300	5.07E+01	<0.0001	170,000.	316	LITTLE AMERICA REF.	CASPE
1.47E-01	2	2.93E-01	2.43E-06	1.22E-06	4.15E-06	168,000	9.36E+00	<0.0001	900,000.	228	SOUTHLAND OIL	LUMBE
1.47E-01	12	1.70E+00	1.41E-05	1.22E-06	4.64E-06	78,500	5.37E+01	<0.0001	160,000.	245	AMOCO	HANDA
1.45E-01	54	7.88E+00	6.54E-05	1.20E-06	1.99E-06	1,940,000	2.14E+02	<0.0001	39,000.	381	CECOS	STAMP
1.43E-01	4	5.06E-01	4.20E-06	1.18E-06	6.61E-06	3,810,000	2.17E+02	<0.0001	39,000.	350	DETROIT COKE	DETRI
1.41E-01	1	1.75E-01	1.45E-06	1.17E-06	3.67E-06	313,000	1.52E+01	<0.0001	550,000.	51	FIRST CHEMICAL CORP	PASCA
1.40E-01	8	1.08E+00	8.94E-06	1.17E-06	1.20E-06	837,000	7.57E+01	<0.0001	110,000.	244	CIBRO PETROLEUM	ALBAN
1.39E-01	2	2.33E-01	1.93E-06	1.16E-06	3.47E-06	1,630,000	1.08E+02	<0.0001	78,000.	177	COLORADO REF.	COMME
1.37E-01	1	1.21E-01	1.00E-06	1.14E-06	3.96E-06	97,800	8.25E+00	<0.0001	*****	144	CROSS OIL & REFINING	SHACK
1.37E-01	16	2.22E+00	1.84E-05	1.14E-06	2.53E-06	463,000	1.52E+02	<0.0001	55,000.	195	DERBY REFINING COMPA	WCHI
1.36E-01	<1	2.66E-02	2.21E-07	1.12E-06	1.69E-06	108,000	2.61E+01	<0.0001	320,000.	232	EXXON	BILLI
1.35E-01	16	2.13E+00	1.76E-05	1.12E-06	1.72E-06	111,000	8.45E+01	<0.0001	100,000.	231	CONOCO REFINERY	BILLI
1.34E-01	71	9.52E+00	7.90E-05	1.11E-06	1.64E-06	131,000	6.79E+01	<0.0001	20,000.	289	PRIDE REFINING	ABILE
1.34E-01	<1	2.20E-02	1.83E-07	1.11E-06	8.58E-06	168,000	5.89E+00	<0.0001	*****	12	OLIN CORP.	ST. M
1.33E-01	1	1.86E-01	1.54E-06	1.11E-06	4.60E-06	297,000	4.23E+01	<0.0001	200,000.	339	NEW BOSTON COKE	PORTS
1.33E-01	<1	3.37E-02	2.79E-07	1.10E-06	1.94E-06	69,300	4.55E+01	<0.0001	190,000.	315	FRONTIER OIL	CHEYE
1.31E-01	12	1.53E+00	1.27E-05	1.09E-06	2.32E-06	1,690,000	8.30E+01	<0.0001	100,000.	181	YOUNG REF.	DOUGL
1.30E-01	20	2.62E+00	2.17E-05	1.08E-06	4.39E-06	807,000	1.80E+02	<0.0001	47,000.	324	SLOSS INDUSTRIES	BIRMI
1.27E-01	44	5.53E+00	4.59E-05	1.05E-06	3.14E-05	8,180,000	4.47E+03	0.0005	1,900.	147	ATLANTIC RICHFIELD	CARSO
1.21E-01	7	8.36E-01	6.94E-06	1.01E-06	7.93E-06	434,000	7.66E+01	<0.0001	110,000.	135	LOUISIANA LAND & EXP	SARAL
1.21E-01	3	3.95E-01	3.28E-06	1.00E-06	2.66E-06	834,000	3.33E+01	<0.0001	250,000.	11	ALPHA CHEMICAL	LAKEI
1.21E-01	2	2.57E-01	2.14E-06	1.00E-06	6.94E-06	1,160,000	7.03E+01	<0.0001	120,000.	193	ROCK ISLAND REFINING	INDIA
1.20E-01	7	7.78E-01	6.46E-06	9.92E-07	4.84E-06	506,000	1.74E+02	<0.0001	48,000.	221	LAKESIDE REF.	KALAM
1.18E-01	<1	8.13E-01	6.75E-09	9.78E-07	2.49E-06	144,000	2.58E+00	<0.0001	*****	283	LIQUID ENERGY CORP.	BRIDG
1.17E-01	<1	1.14E-02	9.44E-08	9.67E-07	2.11E-06	924,000	2.68E+01	<0.0001	310,000.	302	PHILLIPS 66	WOODS
1.16E-01	17	2.00E+00	1.66E-05	9.59E-07	6.01E-06	2,390,000	2.41E+02	<0.0001	35,000.	88	CALGON CARBON	NEVIL
1.15E-01	22	2.56E+00	2.12E-05	9.55E-07	3.07E-06	93,500	3.09E+01	<0.0001	270,000.	353	ENSCO	EL DO
1.15E-01	35	4.00E+00	3.32E-05	9.52E-07	2.03E-06	2,540,000	1.76E+02	<0.0001	48,000.	116	HEAT ENERGY TECH.	DALLA
1.15E-01	163	1.87E+01	1.55E-04	9.51E-07	5.97E-05	2,640,000	2.33E+03	0.0003	3,600.	112	GEORGIA-PACIFIC CORP	PASAD
1.12E-01	2	2.36E-01	1.96E-06	9.32E-07	9.00E-06	1,220,000	1.77E+02	<0.0001	48,000.	246	ASHLAND OIL	CANTO
1.12E-01	12	1.38E+00	1.15E-05	9.31E-07	4.21E-06	2,110,000	1.03E+02	<0.0001	82,000.	347	SHARON STEEL	MONES
1.12E-01	3	3.16E-01	2.62E-06	9.27E-07	1.84E-06	115,000	1.59E+01	<0.0001	530,000.	230	CENEX REF.	LAURE
1.10E-01	2	1.66E-01	1.38E-06	9.11E-07	3.21E-06	399,000	1.85E+01	<0.0001	460,000.	109	E I DUPONT DE NEMOUR	ORANG
1.09E-01	<1	4.66E-02	3.87E-07	9.06E-07	3.96E-06	204,000	2.63E+01	<0.0001	320,000.	291	SHELL OIL REFINERY	ODESS
1.06E-01	40	4.22E+01	3.50E-05	8.78E-07	2.79E-06	609,000	1.67E+02	<0.0001	51,000.	163	OKNARD REF.	OKNAR
1.00E-01	9	9.43E-01	7.82E-06	8.30E-07	4.49E-06	831,000	1.34E+02	<0.0001	63,000.	340	TOLEDO COKE	TOLED
9.70E-02	14	1.39E+01	1.16E-05	8.05E-07	1.56E-06	921,000	6.74E+01	<0.0001	130,000.	298	BIG WEST OIL	SALT
9.68E-02	1	1.08E-01	3.95E-07	8.03E-07	2.11E-06	248,000	5.01E+00	<0.0001	*****	211	HILL PETROLEUM	ST. R
9.67E-02	2	2.40E-01	1.99E-06	8.03E-07	4.18E-06	4,790,000	1.96E+02	<0.0001	43,000.	61	DUPONT	GIBBS

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TABLE D-5. (continued)

Summary for BENZENE REFINERIES
with a Unit Risk of 8.30E-06

SIC= CAS=

- M a x i m u m -					- - M i n i m u m - -					Annual Repeat		S o u r c e
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Incidence	Interval			
9.61E-02	<1	2.17E-02	1.80E-07	7.97E-07	1.84E-06	428,000	1.45E+01	<0.0001580,000.	30	VULCAN MATERIALS	WICHI	
9.56E-02	2	2.16E-01	1.79E-06	7.93E-07	4.16E-06	826,000	6.92E+01	<0.0001120,000.	354	ENVIROSAFE SERVICES	OREGO	
9.49E-02	1	7.78E-02	6.46E-07	7.88E-07	2.72E-06	158,000	8.16E+00	<0.0001*****	101	CAIN CHEMICAL	BRAZO	
9.44E-02	1	5.46E-02	4.54E-07	7.83E-07	3.01E-06	42,300	2.50E+00	<0.0001*****	104	COSDEN OIL & CHEMICA	BIG S	
9.30E-02	9	8.27E-01	6.87E-06	7.72E-07	1.36E-06	1,240,000	5.52E+01	<0.0001150,000.	335	TONAWANDA	TONAW	
9.24E-02	1	8.82E-02	7.32E-07	7.67E-07	2.32E-06	389,000	7.80E+00	<0.0001*****	205	CALUMET REFINING COM	PRINC	
9.07E-02	1	6.44E-02	5.35E-07	7.53E-07	4.64E-06	292,000	1.00E+01	<0.0001840,000.	192	LAKETON REFINING	LAKET	
9.06E-02	3	2.43E-01	2.02E-06	7.52E-07	4.88E-06	1,190,000	2.04E+02	<0.0001 41,000.	329	CITIZENS GAS	INDIA	
8.97E-02	<1	1.81E-02	1.51E-07	7.45E-07	3.90E-05	2,560,000	9.91E+02	0.0001 8,500.	374	ROLLINS ENV. SERVICE	DEER	
8.85E-02	6	5.27E-01	4.38E-06	7.34E-07	2.43E-06	297,000	2.25E+01	<0.0001370,000.	53	REICHHOLD CHEMICALS	GULFP	
8.76E-02	<1	2.11E-03	1.75E-08	7.27E-07	1.63E-06	379,000	8.82E+00	<0.0001960,000.	194	DERBY REF.	EL DO	
8.51E-02	46	3.90E+00	3.24E-05	7.07E-07	5.62E-07	338,000	8.37E+01	<0.0001100,000.	294	TRIFINERY	CORPU	
8.33E-02	28	2.33E+00	1.93E-05	6.91E-07	2.90E-06	2,340,000	1.90E+02	<0.0001 44,000.	89	KOPPERS CO INC	BRIDG	
8.24E-02	2	1.76E-01	1.46E-06	6.84E-07	1.98E-06	196,000	2.00E+01	<0.0001420,000.	313	MURPHY OIL CORPORATI	SUPER	
8.19E-02	<1	1.82E-02	1.51E-07	6.80E-07	2.72E-06	103,000	1.98E+00	<0.0001*****	372	ROGERS LANDFILL	CENTR	
8.03E-02	35	2.81E+00	2.33E-05	6.67E-07	6.80E-06	2,910,000	3.66E+02	<0.0001 23,000.	168	SHELL OIL	MARTI	
7.53E-02	1	4.54E-02	3.77E-07	6.25E-07	3.24E-06	4,490,000	8.57E+01	<0.0001 98,000.	239	MANTUA OIL	THORO	
7.23E-02	35	2.53E+00	2.10E-05	6.00E-07	6.12E-06	2,910,000	3.29E+02	<0.0001 26,000.	173	TOSCO CORP.	MARTI	
7.20E-02	1	4.28E-02	3.55E-07	5.97E-07	4.45E-06	495,000	1.11E+02	<0.0001 76,000.	274	EL PASO REFINING	EL PA	
6.84E-02	1	7.43E-02	6.17E-07	5.68E-07	3.81E-06	372,000	2.25E+01	<0.0001380,000.	16	NIPRO, INC.	AUGUS	
6.16E-02	10	6.16E-01	5.11E-06	5.11E-07	7.42E-07	13,300,000	4.29E+02	0.0001 20,000.	73	TROY CHEMICAL CORP.,	NEWAR	
6.11E-02	24	1.44E+00	1.20E-05	5.07E-07	1.41E-05	2,440,000	3.06E+02	<0.0001 28,000.	333	BETHLEHEM STEEL CORP	SPARR	
5.94E-02	7	4.34E-01	3.61E-06	4.93E-07	7.82E-05	349,000	3.15E+02	<0.0001 27,000.	269	CHEVRON	PORT	
5.84E-02	265	1.55E+01	1.28E-04	4.84E-07	8.54E-06	8,730,000	1.20E+03	0.0001 7,000.	166	POWERINE OIL	SANTA	
5.83E-02	38	2.22E+00	1.84E-05	4.84E-07	1.30E-06	2,600,000	9.69E+01	<0.0001 87,000.	122	S.D.S. BIOTECH CORP.	HOUST	
5.59E-02	<1	2.26E-03	1.87E-08	4.64E-07	2.44E-06	279,000	1.97E+01	<0.0001430,000.	180	AMOCO	SAVAN	
5.46E-02	1	3.86E-02	3.20E-07	4.53E-07	1.85E-06	253,000	4.01E+00	<0.0001*****	220	CRYSTAL REF.	CARSO	
5.09E-02	21	1.05E+00	8.71E-06	4.23E-07	8.02E-07	12,500,000	2.33E+02	<0.0001 36,000.	66	MOBAY CORP.	HALED	
5.01E-02	70	3.52E+00	2.92E-05	4.16E-07	7.01E-07	12,900,000	3.16E+02	<0.0001 27,000.	70	REICHHOLD CHEMICALS	ELIZA	
4.82E-02	<1	2.69E-01	2.24E-08	4.00E-07	4.71E-07	2,520,000	9.26E+00	<0.0001910,000.	377	IT CORPORATION	BENEC	
4.77E-02	48	2.30E+00	1.91E-05	3.96E-07	2.16E-06	2,760,000	7.74E+01	<0.0001110,000.	157	HUNTWAY REF.	BENEC	
4.14E-02	<1	1.85E-02	1.53E-07	3.44E-07	2.41E-07	364,000	4.96E+00	<0.0001*****	117	KOCH INDUSTRIES	CORPU	
4.11E-02	1	2.07E-02	1.72E-07	3.41E-07	1.25E-06	223,000	1.21E+01	<0.0001690,000.	42	VISTA CHEMICAL	WESTL	
4.09E-02	265	1.08E+01	8.99E-05	3.39E-07	5.98E-06	8,730,000	8.41E+02	0.0001 10,000.	156	GOLDEN WEST REFINING	SANTA	
3.97E-02	705	2.79E+01	2.32E-04	3.29E-07	5.04E-05	2,210,000	1.08E+03	0.0001 7,800.	275	EXXON CORP	BAYTO	
3.91E-02	106	4.15E+00	3.44E-05	3.24E-07	1.30E-05	1,270,000	5.71E+02	0.0001 15,000.	336	BETHLEHEM STEEL	LACKA	
3.48E-02	2	5.27E-02	4.37E-07	2.88E-07	5.05E-06	935,000	9.88E+01	<0.0001 85,000.	299	CHEVRON	SALT	
3.30E-02	80	2.62E+00	2.18E-05	2.73E-07	6.74E-07	9,100,000	1.31E+02	<0.0001 64,000.	6	LILLY COATINGS	MONTE	
3.15E-02	<1	4.20E-03	3.48E-08	2.61E-07	1.06E-06	1,800,000	1.32E+01	<0.0001640,000.	48	3-M COMPANY	COTTA	
3.14E-02	<1	6.87E-02	5.70E-08	2.60E-07	6.78E-06	924,000	1.93E+02	<0.0001 44,000.	265	MAPCO PETROLEUM	MEMPH	
3.04E-02	4	1.17E-01	9.68E-07	2.52E-07	1.12E-06	2,280,000	3.98E+01	<0.0001210,000.	346	U.S. STEEL CORP.	CLAIR	
2.66E-02	16	4.14E-01	3.44E-06	2.21E-07	4.89E-06	287,000	2.36E+01	<0.0001360,000.	223	TOTAL PETROLEUM	ALMA	
2.52E-02	2	4.13E-01	3.42E-07	2.09E-07	8.64E-07	1,570,000	1.84E+01	<0.0001460,000.	82	MONSANTO CO	ADDYS	
2.49E-02	2	4.60E-01	3.82E-07	2.07E-07	4.35E-07	3,100,000	4.77E+01	<0.0001180,000.	364	CHEM-CLEAR INC.	BALTI	
2.44E-02	<1	4.12E-01	3.42E-08	2.03E-07	4.64E-07	2,540,000	3.63E+01	<0.0001230,000.	365	CHEM-CLEAR INC.	CLEVE	

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TABLE D-5. (continued)

Summary for BENZENE REFINERIES
with a Unit Risk of 8.30E-06

SIC= CAS=

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- M a x i m u m -					- - M i n i m u m - -					Annual Repeat		S o u r c e
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Incidence	Interval			
2.39E-02	8	1.86E-01	1.54E-06	1.99E-07	3.46E-07	2,060,000	1.97E+01	<0.0001430,000.	9	UPJOHN CO.,THE	NORTH	
2.35E-02	<1	2.85E-03	2.37E-08	1.95E-07	1.94E-07	309,000	1.57E+00	<0.0001*****	2	MONSANTO CO	ANNIS	
2.25E-02	<1	2.40E-03	1.99E-08	1.87E-07	2.19E-05	4,870,000	2.17E+03	0.0003 3,900.	258	CHEVRON	PHILA	
2.10E-02	<1	4.74E-03	3.94E-08	1.75E-07	9.39E-06	626,000	1.60E+02	<0.0001 53,000.	254	SUN REFINING	TULSA	
2.07E-02	13	2.70E-01	2.24E-06	1.72E-07	2.14E-06	2,580,000	3.15E+01	<0.0001270,000.	78	NEPERA CHEMICAL CO.,	HARRI	
1.87E-02	<1	4.23E-03	3.51E-08	1.55E-07	3.40E-07	425,000	2.35E+00	<0.0001*****	29	AIR PRODUCTS & CHEM.	WICHI	
1.82E-02	723	1.32E+01	1.09E-04	1.51E-07	1.20E-05	92,400	1.09E+02	<0.0001 77,000.	251	CONOCO	PONCA	
1.74E-02	10	1.66E-01	1.38E-06	1.45E-07	1.03E-05	2,690,000	5.06E+02	0.0001 17,000.	100	ATLANTIC RICHFIELD	HOUST	
1.70E-02	17	2.96E-01	2.46E-06	1.41E-07	9.45E-07	1,150,000	2.29E+01	<0.0001370,000.	376	HERITAGE ENV. SERVIC	INDIA	
1.49E-02	7	1.02E-01	8.43E-07	1.24E-07	4.73E-07	2,680,000	2.54E+01	<0.0001330,000.	118	KOPPERS	HOUST	
1.45E-02	10	1.38E-01	1.14E-06	1.20E-07	6.78E-07	4,250,000	4.13E+01	<0.0001200,000.	366	CHEM-MET SERVICES	WYAND	
1.24E-02	54	6.73E-01	5.59E-06	1.03E-07	1.70E-07	1,940,000	1.83E+01	<0.0001460,000.	382	CECOS INT'L	BRIST	
9.58E-03	<1	2.19E-05	1.81E-10	7.95E-08	3.32E-07	1,260,000	1.80E+00	<0.0001*****	41	UNION CARBIDE CORP.	HAHNV	
9.31E-03	497	4.62E+00	3.84E-05	7.73E-08	4.39E-06	189,000	4.16E+01	<0.0001200,000.	321	EMPIRE COKE COMPANY	TUSCA	
9.10E-03	<1	2.61E-03	2.17E-08	7.55E-08	3.26E-07	6,100,000	1.87E+01	<0.0001450,000.	363	CID-LANDFILL	CALUM	
9.08E-03	<1	2.49E-03	2.07E-08	7.54E-08	2.65E-07	1,730,000	1.49E+00	<0.0001*****	23	REILLY TAR AND CHEMI	GRANI	
8.85E-03	<1	4.30E-04	3.57E-09	7.34E-08	1.56E-07	2,240,000	4.77E+00	<0.0001*****	115	GOODYEAR TIRE & RUBB	LAPOR	
7.53E-03	<1	1.70E-03	1.41E-08	6.25E-08	1.37E-07	425,000	9.45E-01	<0.0001*****	28	ABBOTT LABORATORIES	WICHI	
7.21E-03	28	2.00E-01	1.66E-06	5.99E-08	1.02E-07	1,170,000	7.93E+00	<0.0001*****	370	FRONTIER CHEMICAL	NIAGR	
7.00E-03	20	1.41E-01	1.17E-06	5.81E-08	1.74E-06	333,000	2.82E+01	<0.0001300,000.	344	ERIE COKE	ERIE	
6.23E-03	230	1.43E+00	1.19E-05	5.17E-08	2.04E-05	2,360,000	1.60E+02	<0.0001 53,000.	328	BETHLEHEM STEEL	BURNS	
5.98E-03	7	3.92E-02	3.25E-07	4.96E-08	1.88E-07	708,000	3.17E+00	<0.0001*****	99	AMOCO CHEMICAL	TEXAS	
5.59E-03	1	5.85E-03	4.85E-08	4.64E-08	2.44E-07	189,000	4.90E-01	<0.0001*****	33	GAF CORP.	CALVE	
4.44E-03	1	4.59E-03	3.81E-08	3.68E-08	1.54E-07	415,000	5.59E-01	<0.0001*****	85	USS CHEMICAL	IRONT	
4.23E-03	1	2.78E-03	2.30E-08	3.51E-08	2.48E-07	649,000	1.12E+00	<0.0001*****	54	MALLINCKRODT CHEM.	RALEI	
3.82E-03	23	8.78E-02	7.29E-07	3.17E-08	2.21E-05	547,000	7.34E+01	<0.0001110,000.	219	STAR REF.	CONVE	
3.65E-03	1	4.97E-03	4.12E-08	3.03E-08	2.25E-08	328,000	3.23E-01	<0.0001*****	102	CELANESE CHEMICAL	BISHO	
3.64E-03	2	7.64E-02	6.34E-08	3.02E-08	7.00E-08	1,970,000	2.02E+00	<0.0001*****	81	BF GOODRICH	AVON	
3.63E-03	<1	1.83E-03	1.52E-09	3.02E-08	9.81E-08	469,000	4.56E-01	<0.0001*****	18	NORCHEM CO.	CLINT	
3.37E-03	15	4.98E-02	4.13E-07	2.80E-08	9.20E-08	804,000	4.07E+00	<0.0001*****	1	ALLIED SIGNAL	BIRMI	
3.35E-03	163	5.46E-01	4.53E-06	2.78E-08	1.74E-06	2,640,000	6.80E+01	<0.0001120,000.	111	GEORGIA GULF CORP.	PASAD	
3.25E-03	233	7.57E-01	6.28E-06	2.70E-08	6.77E-05	284,000	1.01E+02	<0.0001 83,000.	226	CHEVRON	PASCA	
2.51E-03	1	1.70E-01	1.41E-08	2.08E-08	2.70E-08	2,000,000	6.21E-01	<0.0001*****	5	DOW CHEMICAL	PITTS	
2.25E-03	57	1.29E-01	1.07E-06	1.87E-08	2.31E-06	824,000	2.22E+01	<0.0001380,000.	128	HERCULES	MAGNA	
2.24E-03	77	1.73E-01	1.43E-06	1.86E-08	7.51E-07	2,210,000	3.85E+01	<0.0001220,000.	50	MONSANTO CO	ST. L	
2.07E-03	4	8.25E-02	6.85E-08	1.71E-08	2.13E-08	2,090,000	2.07E+00	<0.0001*****	361	CHEMICAL PROCESSORS	SEATT	
1.61E-03	1	1.02E-02	9.49E-09	1.33E-08	4.66E-08	113,000	8.00E-02	<0.0001*****	3	GREAT LAKES CHEMICAL	EL DO	
1.33E-03	1	7.63E-03	6.34E-09	1.10E-08	4.79E-08	395,000	3.32E-01	<0.0001*****	120	MOBIL CHEMICALS	BEAUM	
1.31E-03	845	1.10E+00	9.16E-06	1.08E-08	7.20E-06	158,000	1.12E+01	<0.0001750,000.	261	QUAKER STATE OIL REF	SMETH	
1.20E-03	11	1.30E-02	1.08E-07	9.92E-09	3.24E-08	902,000	2.73E+00	<0.0001*****	76	EASTMAN KODAK	ROCHE	
1.18E-03	360	4.23E-01	3.51E-06	9.75E-09	8.68E-06	76,500	6.15E+00	<0.0001*****	139	MAPCO PETROLEUM	NORTH	
1.07E-03	<1	8.92E-03	7.40E-10	8.89E-09	2.01E-08	200,000	2.16E-02	<0.0001*****	19	CLARK OIL & REFINING	BLUE	
1.05E-03	<1	7.49E-03	6.21E-10	8.73E-09	1.82E-08	2,590,000	5.15E-01	<0.0001*****	113	GLIDDEN COATINGS	CARRO	
1.01E-03	<1	1.16E-03	9.59E-12	8.35E-09	5.85E-08	362,000	1.71E-01	<0.0001*****	17	OLIN CHEMICALS	AUGUS	
7.76E-04	2	1.46E-02	1.21E-08	6.44E-09	2.23E-08	386,000	1.02E-01	<0.0001*****	114	GOODYEAR TIRE	BEAUM	

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TABLE D-5. (continued)

Summary for BENZENE
with a Unit Risk of 8.30E-06

REFINERIES

SIC=

CAS=

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- M a x i m u m -					- - M i n i m u m - -					S o u r c e	
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval		
7.53E-04	1	9.66E-04	8.02E-09	6.25E-09	3.91E-08	294,000	7.37E-02	<0.0001*****		25	US INDUSTRIAL CHEM. TUSCO
7.52E-04	491	3.69E-01	3.06E-06	6.24E-09	9.99E-06	221,000	1.19E+01	<0.0001710,000.		206	CANAL REF. CHURC
7.13E-04	<1	2.15E-04	1.78E-09	5.91E-09	4.96E-08	12,700,000	1.17E+01	<0.0001720,000.		56	AMERICAN CYANAMID CO LINDE
6.99E-04	22	1.54E-02	1.28E-07	5.80E-09	4.49E-04	252	1.19E-01	<0.0001*****		391	USPCI GRASSY MT. KNOWL
6.86E-04	10	6.86E-03	5.70E-08	5.70E-09	8.28E-09	13,300,000	4.79E+00	<0.0001*****		68	ORBIS PRODUCTS CORP NEWAR
6.63E-04	601	3.99E-01	3.31E-06	5.50E-09	4.31E-06	357,000	9.51E+00	<0.0001890,000.		356	ENV. ENTERPRISES CINCI
6.50E-04	525	3.41E-01	2.83E-06	5.39E-09	2.88E-06	406,000	2.99E+01	<0.0001280,000.		134	HUNT REFINING TUSCA
6.19E-04	14	8.42E-03	6.99E-08	5.14E-09	2.23E-08	435,000	6.50E-01	<0.0001*****		79	ALLIED CHEMICAL IRONT
5.53E-04	4	2.39E-03	1.98E-08	4.59E-09	2.26E-08	483,000	1.47E-01	<0.0001*****		96	US ARMY MUNITIONS KINGS
5.47E-04	387	2.12E-01	1.76E-06	4.54E-09	9.82E-06	27,100	2.69E+00	<0.0001*****		272	DIAMOND SHAMROCK SUNRA
5.27E-04	1	3.42E-04	2.84E-09	4.37E-09	1.93E-07	2,450,000	5.39E+00	<0.0001*****		125	UPJOHN CO LA PO
5.16E-04	360	1.86E-01	1.54E-06	4.28E-09	3.81E-06	76,500	2.70E+00	<0.0001*****		140	PETRO STAR NORTH
4.78E-04	170	8.13E-02	6.75E-07	3.97E-09	1.46E-05	206,000	1.89E+01	<0.0001450,000.		379	CASMALIA RESOURCES CASMA
4.58E-04	5	2.19E-03	1.82E-08	3.80E-09	7.69E-09	12,500,000	1.64E+00	<0.0001*****		358	SOLVENT RECOV. SERVI LINDE
3.69E-04	1,270	4.70E-01	3.90E-06	3.06E-09	1.82E-07	556,000	3.33E+00	<0.0001*****		40	STAUFFER CHEMICAL BATON
3.68E-04	38	1.40E-02	1.16E-07	3.05E-09	6.57E-09	613,000	4.08E-01	<0.0001*****		362	CHEMICAL RESOURCES TULSA
3.50E-04	1,450	5.07E-01	4.20E-06	2.90E-09	1.13E-05	432,000	2.74E+01	<0.0001310,000.		133	BELCHER REF. MOBIL
3.32E-04	<1	5.66E-05	4.70E-10	2.75E-09	4.70E-09	300,000	1.68E-02	<0.0001*****		14	DOW CHEMICAL DALTO
3.28E-04	36	1.17E-02	9.73E-08	2.72E-09	1.72E-08	415,000	4.86E-01	<0.0001*****		26	MEAD JOHNSON EVANS
3.12E-04	4	1.26E-03	1.05E-08	2.59E-09	5.15E-07	2,580,000	1.47E+01	<0.0001570,000.		106	DIAMOND SHAMROCK COR DEER
2.85E-04	860	2.45E-01	2.04E-06	2.37E-09	3.08E-06	89,200	2.33E+00	<0.0001*****		378	IT CORPORATION WESTM
2.39E-04	50	1.19E-02	9.90E-08	1.98E-09	6.65E-06	354,000	1.22E+01	<0.0001690,000.		210	HILL PETROLEUM KROTZ
2.35E-04	175	4.11E-02	3.41E-07	1.95E-09	1.66E-06	60,000	2.47E+00	<0.0001*****		242	GIANT REFINERY GALLU
2.01E-04	22	4.42E-02	3.67E-08	1.67E-09	1.91E-05	34,800	1.13E+00	<0.0001*****		138	CHEVRON KENAI
1.91E-04	12	2.22E-02	1.84E-08	1.59E-09	3.28E-09	2,610,000	1.91E-01	<0.0001*****		119	LILLY IND. COATINGS DALLA
1.68E-04	598	1.00E-01	8.33E-07	1.39E-09	2.08E-06	108,000	1.26E+00	<0.0001*****		143	BERRY PETROLEUM STEVE
1.44E-04	1,850	2.66E-01	2.21E-06	1.19E-09	1.32E-06	551,000	2.57E+00	<0.0001*****		38	GEORGIA-PACIFIC CORP FLAQU
1.43E-04	23	3.28E-03	2.73E-08	1.18E-09	3.90E-06	24,400	5.36E-01	<0.0001*****		250	BARRETT REF. THOMA
1.41E-04	2,170	3.05E-01	2.54E-06	1.17E-09	4.91E-06	281,000	9.66E+00	<0.0001870,000.		13	ATLANTIC WOOD INDUST SAVAN
1.41E-04	109	1.53E-01	1.27E-07	1.17E-09	1.87E-06	25,100	3.75E-01	<0.0001*****		197	FARMLAND FACILITIES PHILL
1.34E-04	1,980	2.65E-01	2.20E-06	1.11E-09	2.63E-06	180,000	3.07E+00	<0.0001*****		95	RHONE-POULENC, INC. MT. P
1.31E-04	<1	3.38E-05	2.80E-10	1.09E-09	1.85E-09	573,000	4.61E-02	<0.0001*****		8	DOW CHEMICAL LEDYA
1.17E-04	5	5.85E-04	4.85E-09	9.72E-10	1.23E-09	1,330,000	1.17E-01	<0.0001*****		351	COMMERCIAL DISPOSAL WEST
1.14E-04	24	2.73E-03	2.26E-08	9.50E-10	1.55E-09	5,190,000	1.65E-01	<0.0001*****		55	AMERICAN CYANAMID BRIDG
1.14E-04	29	3.31E-03	2.75E-08	9.50E-10	1.36E-09	13,800,000	1.54E+00	<0.0001*****		360	CALLEIA RES. RECOVER BROOK
9.28E-05	22	2.04E-03	1.69E-08	7.70E-10	8.83E-06	34,800	5.21E-01	<0.0001*****		141	TESARO ALASKA PETROL KENAI
7.86E-05	1,150	9.07E-02	7.53E-07	6.53E-10	5.10E-06	34,300	8.46E-01	<0.0001*****		243	NAVAJO REFINING ARTES
7.75E-05	4	3.33E-04	2.77E-09	6.44E-10	3.68E-09	1,780,000	9.24E-02	<0.0001*****		83	PPG INDUSTRIES NORTO
7.75E-05	<1	2.15E-06	1.79E-11	6.43E-10	3.84E-09	460,000	1.17E-02	<0.0001*****		93	DUPONT LUGOF
7.45E-05	<1	1.28E-06	1.06E-11	6.18E-10	3.63E-09	3,440,000	6.67E-02	<0.0001*****		396	WAYNE DISPOSAL BELLE
7.30E-05	2	1.80E-04	1.49E-09	6.06E-10	2.96E-09	4,570,000	1.09E-01	<0.0001*****		373	ROLLINS ENV. SERVICE BRIDG
7.30E-05	1	3.72E-05	3.09E-10	6.06E-10	3.10E-09	4,810,000	1.45E-01	<0.0001*****		63	HERCULES GIBBS
7.11E-05	5	3.33E-04	2.76E-09	5.90E-10	3.15E-09	2,200,000	1.23E-01	<0.0001*****		21	MONSANTO CO SAUGE
6.30E-05	33	2.08E-02	1.73E-08	5.23E-10	7.81E-06	6,710	1.49E-01	<0.0001*****		142	INTERMOUNTAIN REF. FREDO
5.67E-05	681	3.96E-01	3.21E-07	4.71E-10	4.49E-07	163,000	4.93E-01	<0.0001*****		75	AYERST LABS ROUSE

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TABLE D-5. (continued)

Summary for BENZENE REFINERIES
with a Unit Risk of 8.30E-06

SIC= CAS=

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- M a x i m u m -					- - M i n i m u m - -					S o u r c e	
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval		
4.62E-05	769	3.55E-02	2.95E-07	3.83E-10	7.57E-07	118,000	3.63E-01	<0.0001*****		52 KERR-MCGEE CHEM. COR	MERID
2.74E-05	1,310	3.58E-02	2.97E-07	2.27E-10	5.73E-07	423,000	1.72E+00	<0.0001*****		392 PEORIA DISPOSAL CO..	PEORI
1.38E-05	43	5.93E-04	4.92E-09	1.14E-10	5.93E-08	87,400	1.25E-01	<0.0001*****		123 UNION CARBIDE	SEADR
9.41E-06	489	4.60E-03	3.82E-08	7.81E-11	2.70E-06	536	4.73E-03	<0.0001*****		234 NEVADA REF.	TONOP
3.68E-06	203	7.46E-04	6.20E-09	3.05E-11	4.51E-08	552,000	1.15E-01	<0.0001*****		37 ETHYL CORP.	BATON
1.00E-38		0.00E+00	0.00E+00	0.00E+00	1.00E+38		0.00E+00			130 ALDRICH CHEMICALS	MILWA
1.00E-38		0.00E+00	0.00E+00	0.00E+00	1.00E+38		0.00E+00			136 ARCO ALASKA	KUPAR
					701,000,000 1.75E+05 0.021 48.					O v e r a l l	

TABLE D-6. HEM RESULTS FOR CASE 4 (CONTROLLED MAXIMUM)

Summary for BENZENE
with a Unit Risk of 8.30E-06

REFINERIES

SIC=

CAS=

Page 1 of 9

- M a x i m u m -					- - M i n i m u m - -					S o u r c e				
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval					
9.45E+00	1	7.90E+00	6.56E-05	7.85E-05	7.49E-05	228,000	4.34E+02	0.0001	19,000.	309	TEXACO USA	ANACO		
8.69E+00	13	1.17E+02	9.70E-04	7.21E-05	9.11E-06	1,060,000	5.22E+03	0.0006	1,600.	280	HOWELL HYDROCARBONS	SAN A		
8.55E+00	<1	4.91E-02	4.07E-07	7.09E-05	6.24E-05	230,000	2.92E+02	<0.0001	29,000.	306	SHELL OIL	ANACO		
7.92E+00	<1	1.43E-01	1.19E-06	6.57E-05	7.25E-05	249,000	8.80E+02	0.0001	9,600.	110	EASTMAN KODAK, INC.	LONGV		
7.86E+00	2	1.37E+01	1.13E-04	6.52E-05	1.20E-04	61,000	4.77E+02	0.0001	18,000.	241	BLOOMFIELD REFINING	BLOOM		
6.92E+00	<1	1.21E+00	1.00E-05	5.74E-05	8.84E-05	1,760,000	2.74E+03	0.0003	3,100.	308	SOUND REF.	TACOM		
6.26E+00	11	7.03E+01	5.83E-04	5.20E-05	1.63E-04	7,970,000	1.42E+04	0.0017	590.	149	CHEVRON	EL SE		
6.07E+00	6	3.45E+01	2.86E-04	5.04E-05	1.04E-04	7,880,000	1.15E+04	0.0014	730.	174	UNION OIL OF CALIFOR	WILMI		
6.03E+00	10	6.19E+01	5.13E-04	5.01E-05	1.38E-04	4,530,000	5.16E+03	0.0006	1,600.	162	NEWHALL REFINING CO.	NEWHA		
5.91E+00	2	1.25E+01	1.04E-04	4.90E-05	1.79E-04	3,070,000	5.31E+03	0.0006	1,600.	150	CHEVRON	RICHM		
5.87E+00	18	1.05E+02	8.70E-04	4.88E-05	2.11E-04	556,000	6.33E+03	0.0008	1,300.	209	EXXON CORP	BATON		
5.54E+00	1	4.82E+00	4.00E-05	4.60E-05	1.01E-04	207,000	3.88E+02	<0.0001	22,000.	260	PENNZOIL COMPANY	ROUSE		
5.48E+00	<1	2.26E+00	1.88E-05	4.55E-05	4.27E-05	151,000	1.61E+02	<0.0001	52,000.	307	SOHIO	FERND		
5.23E+00	71	3.69E+02	3.06E-03	4.34E-05	8.15E-05	8,200,000	1.80E+04	0.0021	470.	148	CHEMOIL	SIGNA		
5.12E+00	112	5.73E+02	4.76E-03	4.25E-05	1.60E-03	2,030,000	3.50E+04	0.0041	240.	98	AMERICAN HOECHST COR	HOUST		
4.74E+00	6	2.97E+01	2.47E-04	3.93E-05	9.47E-05	325,000	5.30E+03	0.0006	1,600.	159	KERN OIL & REFINING	BAKER		
4.74E+00	1	5.76E+00	4.78E-05	3.93E-05	9.23E-05	325,000	2.62E+03	0.0003	3,200.	167	SAN JOAQUIN REF.	BAKER		
4.51E+00	<1	2.18E-01	1.81E-06	3.74E-05	8.89E-05	2,590,000	3.21E+03	0.0004	2,600.	290	SHELL OIL	DEER		
4.46E+00	<1	8.91E-01	7.39E-06	3.70E-05	4.09E-05	125,000	8.84E+01	<0.0001	95,000.	304	ARCO PETROLEUM	FERND		
4.37E+00	18	7.66E+01	6.36E-04	3.63E-05	2.62E-04	1,190,000	8.53E+03	0.0010	990.	215	MURPHY OIL CORPORATI	MERAU		
4.32E+00	<1	2.04E+00	1.69E-05	3.58E-05	1.36E-04	695,000	1.68E+03	0.0002	5,000.	266	AMOCO	TEXAS		
4.19E+00	1	2.83E+00	2.35E-05	3.48E-05	1.46E-04	397,000	1.45E+03	0.0002	5,800.	286	MOBIL OIL	BEAUM		
4.18E+00	<1	1.01E-01	8.36E-07	3.47E-05	7.75E-05	379,000	4.21E+02	0.0001	20,000.	199	TEXACO REFINING	EL DO		
4.08E+00	<1	1.45E+00	1.20E-05	3.39E-05	6.58E-05	929,000	1.79E+03	0.0002	4,700.	300	CRYSEN REFINING	WOODS		
4.02E+00	<1	1.62E+00	1.35E-05	3.34E-05	7.75E-05	126,000	1.33E+02	<0.0001	63,000.	229	SOUTHLAND OIL	SANDE		
4.02E+00	3	1.03E+01	8.52E-05	3.33E-05	2.62E-05	893,000	1.03E+03	0.0001	8,100.	91	UNION CARBIDE	PENUE		
3.97E+00	<1	3.26E-01	2.71E-06	3.29E-05	2.34E-04	326,000	9.74E+02	0.0001	8,700.	191	INDIANA FARM BUREAU	MT. V		
3.95E+00	1	3.64E+00	3.02E-05	3.28E-05	1.32E-04	228,000	5.81E+02	0.0001	15,000.	207	CITGO PETROLEUM	LAKE		
3.94E+00	65	2.57E+02	2.13E-03	3.27E-05	6.70E-05	1,310,000	1.01E+04	0.0012	840.	256	CHEVRON	PORTL		
3.92E+00	7	2.90E+01	2.41E-04	3.25E-05	2.04E-04	1,170,000	5.30E+03	0.0006	1,600.	27	REILLY TAR AND CHEMI	INDIA		
3.84E+00	3	1.12E+01	9.27E-05	3.19E-05	6.65E-05	134,000	7.13E+02	0.0001	12,000.	196	FARMLAND INDUSTRIES	COFFE		
3.81E+00	<1	8.66E-01	7.19E-06	3.16E-05	7.23E-05	30,900	5.97E+01	<0.0001	140,000.	301	PENNZOIL	ROOSE		
3.81E+00	<1	1.28E+00	1.06E-05	3.16E-05	4.36E-05	17,500	4.13E+01	<0.0001	120,000.	317	SINCLAIR OIL	SINCL		
3.80E+00	<1	6.69E-02	5.55E-07	3.15E-05	9.87E-05	763,000	6.24E+02	0.0001	14,000.	183	HAWAII INDEP. REF.	EWA B		
3.79E+00	<1	9.56E-02	7.94E-07	3.15E-05	1.30E-04	137,000	7.05E+02	0.0001	12,000.	107	DOW CHEMICAL USA	FREEP		
3.75E+00	<1	4.20E-01	3.48E-06	3.11E-05	1.48E-04	359,000	9.30E+02	0.0001	9,100.	293	STAR REF.	PORT		
3.74E+00	10	3.71E+01	3.08E-04	3.11E-05	1.29E-04	5,420,000	8.21E+03	0.0010	1,000.	190	AMOCO CHEMICAL	WHITI		
3.69E+00	<1	1.16E+00	9.61E-06	3.06E-05	1.53E-04	4,830,000	7.55E+03	0.0009	1,100.	240	MOBIL OIL	PAULS		
3.64E+00	2	6.32E+00	5.25E-05	3.03E-05	1.41E-04	720,000	7.01E+02	0.0001	12,000.	213	MARATHON PETROLEUM	GARYV		
3.59E+00	21	7.62E+01	6.32E-04	2.98E-05	2.09E-05	382,000	1.45E+03	0.0002	5,800.	397	TEXAS ECOLOGISTS	ROBST		
3.56E+00	1	2.37E+00	1.97E-05	2.95E-05	1.45E-04	110,000	1.94E+03	0.0002	4,300.	227	ERGON REF.	VICKS		
3.55E+00	1	3.81E+00	3.16E-05	2.95E-05	4.80E-05	3,220,000	1.62E+03	0.0002	5,200.	164	PACIFIC REF.	HERCU		
3.49E+00	1	4.24E+00	3.52E-05	2.90E-05	6.81E-05	325,000	1.93E+03	0.0002	4,400.	170	SUNLAND REF.	BAKER		
3.49E+00	89	3.11E+02	2.58E-03	2.90E-05	1.14E-04	2,680,000	7.17E+03	0.0009	1,200.	278	HILL PETROLEUM	HOUST		
3.49E+00	1	3.01E+00	2.50E-05	2.90E-05	2.94E-05	259,000	8.18E+02	0.0001	10,000.	282	LA GLORIA OIL AND GA	TYLER		

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TABLE D-6. (continued)

Summary for BENZENE
with a Unit Risk of 8.30E-06

SIC= CAS=

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- M a x i m u m -					- - M i n i m u m - -					Annual Repeat		S o u r c e
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Incidence	Interval			
3.45E+00	13	4.55E+01	3.78E-04	2.87E-05	1.26E-04	697,000	2.20E+03	0.0003	3,800.	279	HILL PETROLEUM	TEXAS
3.35E+00	4	1.36E+01	1.13E-04	2.78E-05	3.05E-05	88,000	3.55E+02	<0.0001	24,000.	255	TOTAL PETROLEUM	ARDMO
3.28E+00	5	1.75E+01	1.45E-04	2.72E-05	1.16E-04	6,360,000	1.14E+04	0.0013	740.	184	CLARK OIL & REFINING	BLUE
3.24E+00	1	3.93E+00	3.26E-05	2.69E-05	6.31E-05	325,000	1.79E+03	0.0002	4,700.	171	TEXACO REFINING	BAKER
3.18E+00	1	2.05E+00	1.70E-05	2.64E-05	2.67E-05	102,000	1.56E+02	<0.0001	54,000.	126	WITCO CHEMICAL CORPO	POINT
3.16E+00	111	3.50E+02	2.91E-03	2.62E-05	5.10E-05	8,090,000	1.06E+04	0.0013	800.	169	SHELL OIL	WILMI
3.15E+00	<1	5.66E-01	4.69E-06	2.61E-05	6.02E-05	192,000	2.15E+02	<0.0001	39,000.	264	UNITED REF.	WARRE
3.09E+00	1	1.98E+00	1.64E-05	2.56E-05	9.52E-05	1,270,000	7.24E+02	0.0001	12,000.	217	SHELL CHEM CO	NORCO
3.02E+00	<1	1.05E+00	8.67E-06	2.50E-05	1.08E-04	377,000	8.40E+02	0.0001	10,000.	201	ASHLAND PETROLEUM CO	ASHLA
2.99E+00	1	2.96E+00	2.46E-05	2.48E-05	1.05E-04	209,000	3.31E+02	<0.0001	25,000.	151	CONOCO	SANTA
2.96E+00	1	3.24E+00	2.69E-05	2.46E-05	1.32E-04	55,300	2.57E+02	<0.0001	33,000.	287	PHILLIPS 66 REFINERY	BORGE
2.90E+00	<1	5.05E-01	4.19E-06	2.41E-05	3.70E-05	1,760,000	1.15E+03	0.0001	7,300.	310	U.S. OIL & REFINING	TACOM
2.89E+00	<1	5.79E-01	4.80E-06	2.40E-05	1.23E-04	1,140,000	8.42E+02	0.0001	10,000.	218	BP OIL	BELLE
2.88E+00	<1	1.25E+00	1.04E-05	2.39E-05	1.10E-04	38,900	9.73E+01	<0.0001	87,000.	276	FINA OIL	BIG S
2.83E+00	4	1.22E+01	1.01E-04	2.35E-05	5.22E-05	10,500,000	6.24E+03	0.0007	1,400.	64	INT'L FLAVORS & FRAG	UNION
2.83E+00	13	3.64E+01	3.02E-04	2.35E-05	1.05E-04	1,970,000	2.70E+03	0.0003	3,100.	319	ASHLAND PETROLEUM	ST. P
2.80E+00	3	9.68E+00	8.04E-05	2.32E-05	5.06E-05	147,000	5.73E+02	0.0001	15,000.	198	NATIONAL COOPERATIVE	MCPHE
2.78E+00	1	2.81E+00	2.34E-05	2.30E-05	4.77E-05	361,000	1.92E+02	<0.0001	44,000.	132	MOBAY CHEMICAL CORP	NEW M
2.76E+00	105	2.91E+02	2.41E-03	2.29E-05	4.07E-05	8,550,000	1.14E+04	0.0013	740.	165	PARAMOUNT PET.	PARAM
2.75E+00	<1	1.07E+00	8.87E-06	2.28E-05	2.18E-05	34,700	1.19E+02	<0.0001	71,000.	273	DIAMOND SHAMROCK REF	THREE
2.71E+00	<1	2.81E-01	2.33E-06	2.25E-05	1.82E-05	339,000	1.20E+03	0.0001	7,000.	267	CHAMPLIN PETROLEUM C	CORPU
2.70E+00	1	3.45E+00	2.86E-05	2.24E-05	9.01E-05	1,380,000	6.19E+02	0.0001	14,000.	387	CECOS INT'L	WILLI
2.69E+00	15	3.95E+01	3.28E-04	2.23E-05	4.39E-05	625,000	1.74E+03	0.0002	4,900.	253	SINCLAIR OIL	TULSA
2.68E+00	<1	1.27E-01	1.06E-06	2.22E-05	1.10E-04	2,060,000	1.64E+03	0.0002	5,200.	188	SHELL OIL	WOOD
2.56E+00	2	5.26E+00	4.37E-05	2.12E-05	7.84E-05	225,000	7.17E+02	0.0001	12,000.	204	CALCASIEU REFINING	LAKE
2.55E+00	4	9.64E+00	8.00E-05	2.12E-05	5.51E-05	197,000	4.09E+02	<0.0001	21,000.	259	WITCO CHEMICAL CORP.	BRADF
2.50E+00	4	9.36E+00	7.77E-05	2.08E-05	6.16E-05	2,920,000	1.77E+03	0.0002	4,800.	176	UNION OIL OF CALIFOR	RODEO
2.47E+00	25	6.06E+01	5.03E-04	2.05E-05	1.58E-04	494,000	3.48E+03	0.0004	2,400.	268	CHEVRON	EL PA
2.46E+00	3	6.68E+00	5.55E-05	2.04E-05	1.98E-05	859,000	9.04E+02	0.0001	9,300.	77	GENERAL ELECTRIC	WATER
2.40E+00	4	8.49E+00	7.05E-05	1.99E-05	1.11E-04	3,810,000	3.64E+03	0.0004	2,300.	222	MARATHON PET.	DETRO
2.40E+00	3	6.41E+00	5.32E-05	1.99E-05	1.43E-04	9,580	2.73E+02	<0.0001	31,000.	318	WYOMING REF.	NEWCA
2.40E+00	1	2.19E+00	1.82E-05	1.99E-05	6.61E-05	171,000	1.15E+02	<0.0001	73,000.	288	PHILLIPS	SWEEN
2.38E+00	17	3.94E+01	3.27E-04	1.97E-05	6.38E-05	8,460,000	6.04E+03	0.0007	1,400.	161	MOBIL OIL	TORRA
2.38E+00	6	1.44E+01	1.20E-04	1.97E-05	4.25E-05	327,000	2.14E+03	0.0003	3,900.	155	WITCO CORP.	OILDA
2.37E+00	7	1.55E+01	1.29E-04	1.96E-05	7.92E-05	676,000	1.25E+03	0.0001	6,800.	285	MARATHON OIL	TEXAS
2.35E+00	6	1.43E+01	1.18E-04	1.95E-05	4.20E-05	327,000	2.11E+03	0.0003	4,000.	7	WITCO CORP.	OILDA
2.33E+00	50	1.16E+02	9.59E-04	1.94E-05	4.83E-05	83,000	2.82E+03	0.0003	3,000.	233	MONTANA REFINING COM	GREAT
2.33E+00	<1	2.77E-01	2.30E-06	1.94E-05	8.23E-05	1,900,000	1.16E+03	0.0001	7,200.	224	KOCH REFINING	ROSEM
2.33E+00	1	1.48E+00	1.23E-05	1.93E-05	5.61E-05	1,640,000	1.52E+03	0.0002	5,500.	178	CONOCO	COMME
2.31E+00	40	9.28E+01	7.70E-04	1.92E-05	6.84E-05	8,530,000	1.10E+04	0.0013	770.	160	LUNDAY-THAGARD CO.	SOUTH
2.28E+00	<1	1.02E+00	8.45E-06	1.90E-05	1.33E-05	364,000	2.73E+02	<0.0001	31,000.	281	KOCH INDUSTRIES	CORPU
2.27E+00	<1	1.23E-01	1.02E-06	1.88E-05	3.97E-05	75,300	7.71E+02	0.0001	11,000.	314	AMOCO	CASPE
2.25E+00	1	2.51E+00	2.09E-05	1.87E-05	4.92E-05	248,000	1.17E+02	<0.0001	72,000.	212	KERR-MCGEE REFINING	COTTO
2.22E+00	1	2.30E+00	1.91E-05	1.84E-05	7.69E-05	415,000	2.80E+02	<0.0001	30,000.	80	ARIS TECH CHEMICAL	HAYER
2.21E+00	1	1.1E+00	9.60E-06	1.83E-05	2.34E-05	92,200	6.74E+01	<0.0001	130,000.	252	KERR MCGEE	WYNNE

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TABLE D-6. (continued)

Summary for BENZENE REFINERIES
with a Unit Risk of 8.30E-06

SIC= CAS=

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- M a x i m u m -					- - M i n i m u m - -					Annual Repeat		S o u r c e
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Incidence	Interval			
2.21E+00	34	7.42E+01	6.16E-04	1.83E-05	5.74E-05	381,000	2.57E+03	0.0003	3,300.	203 PENNZOIL	SHREV	
2.20E+00	1	2.58E+00	2.14E-05	1.83E-05	9.92E-05	159,000	5.14E+02	0.0001	16,000.	186 MARATHON PETROLEUM	ROBIN	
2.20E+00	<1	5.94E-02	4.93E-07	1.83E-05	4.67E-05	230,000	6.64E+01	<0.0001	130,000.	146 ANCHOR REF.	MCKIT	
2.16E+00	28	5.96E+01	4.95E-04	1.80E-05	5.36E-05	92,800	1.40E+03	0.0002	6,000.	145 LION OIL	EL DO	
2.13E+00	<1	2.70E-01	2.24E-06	1.76E-05	1.21E-04	1,190,000	4.22E+03	0.0005	2,000.	214 MOBIL	CHALM	
2.10E+00	9	1.98E+01	1.64E-04	1.74E-05	9.43E-05	831,000	2.81E+03	0.0003	3,000.	340 TOLEDO COKE	TOLED	
2.10E+00	6	1.28E+01	1.06E-04	1.74E-05	8.93E-05	2,090,000	1.45E+03	0.0002	5,800.	185 CLARK OIL & REF.	HARTF	
2.08E+00	1	1.91E+00	1.58E-05	1.73E-05	4.17E-05	2,670,000	1.79E+03	0.0002	4,700.	271 CROWN CENTRAL	HOUST	
2.08E+00	14	2.98E+01	2.48E-04	1.72E-05	3.33E-05	921,000	1.44E+03	0.0002	5,800.	297 AMOCO OIL REFINERY	SALT	
2.04E+00	1	1.09E+00	9.04E-06	1.69E-05	3.63E-05	110,000	1.54E+02	<0.0001	55,000.	200 TOTAL PETROLEUM	ARKAN	
2.03E+00	17	3.48E+01	2.89E-04	1.69E-05	3.71E-05	2,790,000	7.71E+03	0.0009	1,100.	44 FMC CORP.	BALTI	
2.03E+00	9	1.79E+01	1.48E-04	1.69E-05	2.87E-05	12,700,000	8.27E+03	0.0010	1,000.	238 EXXON	LINDE	
2.01E+00	2	4.63E+00	3.85E-05	1.67E-05	6.16E-05	225,000	5.46E+02	0.0001	15,000.	208 CONOCO CHEMICALS	WESTL	
2.01E+00	2	3.35E+00	2.78E-05	1.67E-05	5.00E-05	1,630,000	1.56E+03	0.0002	5,400.	177 COLORADO REF.	COMME	
2.01E+00	1	2.81E+00	2.34E-05	1.66E-05	1.03E-04	927,000	8.19E+02	0.0001	10,000.	312 QUAKER STATE OIL REF	NEWEL	
2.00E+00	111	2.21E+02	1.84E-03	1.66E-05	3.23E-05	8,090,000	6.68E+03	0.0008	1,300.	158 HUNTWAY REF.	WILMI	
1.99E+00	207	4.12E+02	3.42E-03	1.65E-05	5.64E-05	8,640,000	1.21E+04	0.0014	700.	175 UNOCAL	LOS A	
1.98E+00	2	3.04E+00	2.53E-05	1.64E-05	8.55E-05	971,000	5.15E+02	0.0001	16,000.	303 AMOCO OIL REFINERY	YORKT	
1.95E+00	7	1.34E+01	1.11E-04	1.62E-05	1.27E-04	434,000	1.23E+03	0.0001	6,900.	135 LOUISIANA LAND & EXP	SARAL	
1.95E+00	4	7.77E+00	6.45E-05	1.61E-05	2.01E-05	2,090,000	1.95E+03	0.0002	4,300.	305 CHEVRON	SEATT	
1.92E+00	<1	2.27E-01	1.88E-06	1.59E-05	6.71E-05	1,510,000	5.92E+02	0.0001	14,000.	187 MOBIL OIL	JOLIE	
1.89E+00	2	3.76E+00	3.12E-05	1.57E-05	5.33E-05	168,000	1.20E+02	<0.0001	70,000.	228 SOUTHLAND OIL	LUMBE	
1.88E+00	46	8.61E+01	7.15E-04	1.56E-05	1.24E-05	338,000	1.85E+03	0.0002	4,600.	292 SOUTHWESTERN REFININ	CORPU	
1.87E+00	2	4.08E+00	3.38E-05	1.55E-05	5.04E-05	555,000	6.51E+02	0.0001	13,000.	216 PLACID REFINING	PORT	
1.83E+00	1	1.02E+00	8.49E-06	1.52E-05	5.29E-05	388,000	4.91E+02	0.0001	17,000.	295 UNION OIL OF CALIFOR	NEDER	
1.80E+00	<1	1.33E-01	1.11E-06	1.49E-05	5.23E-05	154,000	7.00E+01	<0.0001	120,000.	225 AMERADA HESS	PURVI	
1.80E+00	48	8.70E+01	7.22E-04	1.49E-05	8.16E-05	2,760,000	2.92E+03	0.0003	2,900.	153 EXXON	BENIC	
1.79E+00	1	1.48E+00	1.22E-05	1.49E-05	4.31E-05	392,000	3.06E+02	<0.0001	28,000.	108 DUPONT	BEAUM	
1.76E+00	1	1.55E+00	1.29E-05	1.46E-05	5.08E-05	97,800	1.06E+02	<0.0001	80,000.	144 CROSS OIL & REFINING	SHACK	
1.72E+00	16	2.71E+01	2.25E-04	1.43E-05	2.20E-05	111,000	1.08E+03	0.0001	7,800.	231 CONOCO REFINERY	BILLI	
1.72E+00	3	5.91E+00	4.90E-05	1.43E-05	6.22E-05	4,750,000	1.70E+03	0.0002	5,000.	394 WASTE CONVERSION	HATFI	
1.70E+00	27	4.62E+01	3.83E-04	1.41E-05	6.54E-05	4,440,000	4.04E+03	0.0005	2,100.	262 BP OIL	MARCU	
1.70E+00	4	6.60E+00	5.48E-05	1.41E-05	2.79E-05	8,070,000	3.74E+03	0.0004	2,300.	172 TEXACO REFINING	WILMI	
1.69E+00	12	1.96E+01	1.62E-04	1.40E-05	2.97E-05	1,690,000	1.06E+03	0.0001	7,900.	181 YOUNG REF.	DOUGL	
1.68E+00	30	5.09E+01	4.22E-04	1.40E-05	2.87E-05	8,170,000	4.73E+03	0.0006	1,800.	154 FLETCHER OIL & REFIN	WILMI	
1.68E+00	1	1.85E+00	1.54E-05	1.40E-05	1.06E-05	344,000	5.39E+02	0.0001	16,000.	270 COASTAL REFINING	CORPU	
1.68E+00	<1	3.58E-01	2.97E-06	1.39E-05	5.86E-05	382,000	4.07E+02	<0.0001	21,000.	352 ASHLAND CHEMICAL	BOYD	
1.66E+00	<1	9.06E-02	7.52E-07	1.38E-05	2.91E-05	75,300	5.66E+02	0.0001	15,000.	316 LITTLE AMERICA REF.	CASPE	
1.66E+00	<1	2.92E-02	2.43E-07	1.38E-05	4.31E-05	763,000	2.72E+02	<0.0001	31,000.	182 CHEVRON	HONOL	
1.66E+00	21	3.53E+01	2.93E-04	1.37E-05	6.49E-05	4,450,000	3.22E+03	0.0004	2,600.	263 SUN PETROLEUM	MARCU	
1.62E+00	97	1.56E+02	1.30E-03	1.34E-05	5.43E-05	333,000	1.82E+03	0.0002	4,600.	247 STANDARD OIL OF OHIO	LIMA	
1.61E+00	12	1.92E+01	1.59E-04	1.34E-05	1.99E-05	11,600,000	5.06E+03	0.0006	1,700.	236 CHEVRON	PERTH	
1.59E+00	12	1.84E+01	1.53E-04	1.32E-05	5.03E-05	78,500	5.82E+02	0.0001	14,000.	245 AMOCO	MANDA	
1.57E+00	18	2.76E+01	2.29E-04	1.30E-05	5.53E-05	6,550,000	2.92E+03	0.0003	2,900.	189 UNION OIL OF CALIFOR	LEMON	
1.57E+00	<1	6.69E-01	5.55E-06	1.30E-05	5.68E-05	204,000	3.78E+02	<0.0001	22,000.	291 SHELL OIL REFINERY	ODESS	

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TABLE D-6. (continued)

Summary for BENZENE
with a Unit Risk of 8.30E-06

SIC= CAS=

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- M a x i m u m -					- - M i n i m u m - -					S o u r c e	
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval		
1.55E+00	2	3.30E+00	2.74E-05	1.29E-05	4.79E-05	4,560,000	1.78E+03	0.0002	4,700.	57 ATLANTIC WOOD INDUST	HAINE
1.54E+00	3	4.35E+00	3.61E-05	1.28E-05	2.54E-05	115,000	2.19E+02	<0.0001	38,000.	230 CENEX REF.	LAURE
1.54E+00	4,530	6.98E+03	5.79E-02	1.28E-05	1.23E-03	2,380,000	4.31E+04	0.0051	200.	97 AMERICAN HOECHST COR	PASAD
1.51E+00	<1	1.04E-02	8.65E-08	1.26E-05	3.19E-05	144,000	3.31E+01	<0.0001	1260,000.	283 LIQUID ENERGY CORP.	BRIDG
1.51E+00	<1	2.97E-01	2.46E-06	1.25E-05	1.88E-05	108,000	2.91E+02	<0.0001	29,000.	232 EXXON	BILLI
1.49E+00	2	3.14E+00	2.61E-05	1.24E-05	1.20E-04	1,220,000	2.35E+03	0.0003	3,600.	246 ASHLAND OIL	CANTO
1.46E+00	4	5.62E+00	4.66E-05	1.21E-05	5.37E-05	2,280,000	1.92E+03	0.0002	4,400.	346 U.S. STEEL CORP.	CLAIR
1.45E+00	<1	5.77E-01	4.79E-06	1.20E-05	3.73E-05	857,000	1.93E+02	<0.0001	44,000.	121 MONSANTO CO	ALVIN
1.42E+00	3	4.86E+00	4.04E-05	1.17E-05	6.87E-05	234,000	2.03E+02	<0.0001	42,000.	311 MIDATLANTIC REF.	ST. M
1.41E+00	<1	2.32E-02	1.92E-07	1.17E-05	5.53E-05	1,400,000	5.22E+02	0.0001	16,000.	179 STAR REF.	DELAW
1.41E+00	<1	1.38E-01	1.14E-06	1.17E-05	2.55E-05	924,000	3.24E+02	<0.0001	26,000.	302 PHILLIPS 66	WOODS
1.38E+00	2	2.93E+00	2.43E-05	1.14E-05	7.91E-05	1,160,000	8.01E+02	0.0001	11,000.	193 ROCK ISLAND REFINING	INDIA
1.37E+00	33	4.48E+01	3.72E-04	1.14E-05	6.70E-05	817,000	1.92E+03	0.0002	4,400.	249 SUN CO.	TOLED
1.36E+00	40	5.41E+01	4.49E-04	1.13E-05	3.57E-05	609,000	2.14E+03	0.0003	3,900.	163 OKNARD REF.	OKNAR
1.32E+00	13	1.77E+01	1.47E-04	1.10E-05	2.51E-05	2,590,000	2.16E+03	0.0003	3,900.	341 LTV STEEL	CLEVE
1.30E+00	1	1.90E+00	1.58E-05	1.08E-05	6.25E-05	838,000	6.52E+02	0.0001	13,000.	248 STANDARD OIL OF OHIO	TOLED
1.29E+00	2	2.82E+00	2.34E-05	1.07E-05	7.64E-06	358,000	2.14E+02	<0.0001	39,000.	296 VALERO ENERGY CORP.	CORPU
1.26E+00	44	5.58E+01	4.63E-04	1.05E-05	4.91E-05	4,900,000	8.15E+03	0.0010	1,000.	257 ATLANTIC REFINING	PHILA
1.26E+00	42	5.22E+01	4.33E-04	1.04E-05	4.81E-05	2,310,000	3.48E+03	0.0004	2,400.	343 LTV STEEL COMPANY	PITTS
1.21E+00	14	1.74E+01	1.44E-04	1.00E-05	1.94E-05	921,000	8.40E+02	0.0001	10,000.	298 BIG WEST OIL	SALT
1.19E+00	<1	8.16E-02	6.77E-07	9.87E-06	2.30E-05	3,080,000	6.23E+02	0.0001	14,000.	45 VISTA CHEMICAL	BALTI
1.19E+00	16	1.92E+01	1.60E-04	9.85E-06	2.19E-05	463,000	1.32E+03	0.0002	6,400.	195 DERBY REFINING COMPA	WICHI
1.19E+00	2	2.38E+00	1.98E-05	9.85E-06	5.43E-05	166,000	2.18E+02	<0.0001	39,000.	202 SOMERSET REFINERY	SOMER
1.19E+00	<1	3.00E-01	2.49E-06	9.84E-06	1.73E-05	69,300	4.07E+02	<0.0001	21,000.	315 FRONTIER OIL	CHEYE
1.19E+00	1	1.13E+00	9.39E-06	9.84E-06	2.97E-05	389,000	1.00E+02	<0.0001	84,000.	205 CALUMET REFINING COM	PRINC
1.18E+00	1	9.78E-01	8.12E-06	9.83E-06	2.00E-05	725,000	3.29E+02	<0.0001	26,000.	348 U.S. STEEL CORP.	PROVO
1.18E+00	36	4.24E+01	3.52E-04	9.78E-06	1.77E-05	8,630,000	4.54E+03	0.0005	1,900.	152 EDGINGTON OIL COMPAN	LONG
1.16E+00	1	8.26E-01	6.86E-06	9.66E-06	5.95E-05	292,000	1.29E+02	<0.0001	66,000.	192 LAKETON REFINING	LAKET
1.13E+00	<1	2.87E-02	2.38E-07	9.41E-06	4.00E-05	5,490,000	1.07E+03	0.0001	7,800.	330 INLAND STEEL	E CHI
1.13E+00	13	1.42E+01	1.18E-04	9.37E-06	4.44E-05	4,840,000	3.33E+03	0.0004	2,500.	237 COASTAL EAGLE PT.	WESTV
1.08E+00	8	8.28E+00	6.87E-05	8.96E-06	9.22E-06	837,000	5.81E+02	0.0001	15,000.	244 CIBRO PETROLEUM	ALBAN
1.05E+00	28	2.97E+01	2.47E-04	8.70E-06	2.79E-05	1,160,000	1.66E+03	0.0002	5,100.	342 BETHLEHEM STEEL CORP	BETHL
1.03E+00	71	7.31E+01	6.07E-04	8.57E-06	1.26E-05	131,000	5.22E+02	0.0001	16,000.	289 PRIDE REFINING	ABILE
1.02E+00	2	2.18E+00	1.81E-05	8.49E-06	2.46E-05	196,000	2.48E+02	<0.0001	34,000.	313 MURPHY OIL CORPORATI	SUPER
1.02E+00	22	2.23E+01	1.85E-04	8.44E-06	3.55E-05	2,190,000	1.20E+03	0.0001	7,000.	338 ARMCO INC	SUPPL
1.01E+00	2	2.17E+00	1.80E-05	8.35E-06	9.24E-06	335,000	3.31E+02	<0.0001	25,000.	323 GULF STATES	GADSD
9.75E-01	18	1.72E+01	1.43E-04	8.09E-06	4.05E-05	52,700	6.12E+02	0.0001	14,000.	103 CELANESE CORP.	PAMPA
9.51E-01	13	1.24E+01	1.03E-04	7.89E-06	1.93E-05	2,690,000	1.03E+03	0.0001	8,200.	359 ERIEWAY POLL. CONTRO	BEDFO
9.50E-01	3	2.43E+00	2.01E-05	7.89E-06	6.19E-06	893,000	2.45E+02	<0.0001	34,000.	92 UNION CARBIDE CARIBE	PONCE
8.69E-01	7	5.66E+00	4.69E-05	7.21E-06	3.52E-05	506,000	1.27E+03	0.0002	6,700.	221 LAKESIDE REF.	KALAM
8.68E-01	1	7.17E-01	5.95E-06	7.20E-06	4.47E-05	1,030,000	5.49E+02	0.0001	15,000.	349 WHEELING PITT	E STE
8.46E-01	35	2.96E+01	2.46E-04	7.03E-06	7.16E-05	2,910,000	3.85E+03	0.0005	2,200.	168 SHELL OIL	MARTI
8.42E-01	<1	2.03E-02	1.69E-07	6.99E-06	1.56E-05	379,000	8.48E+01	<0.0001	99,000.	194 DERBY REF.	EL DO
7.74E-01	3	2.01E+00	1.67E-05	6.43E-06	9.29E-06	810,000	5.51E+02	0.0001	15,000.	320 ABC COKE	TARRA
7.63E-01	1	7.43E-01	6.17E-06	6.33E-06	1.33E-05	300,000	7.48E+01	<0.0001	110,000.	380 IT CORP.-PETROL. WAS	BUTTO

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TABLE D-6. (continued)

Summary for BENZENE
with a Unit Risk of 8.30E-06

REFINERIES

SIC=

CAS=

- M a x i m u m -					- - M i n i m u m - -					Annual			Repeat		S o u r c e	
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Incidence	Interval	Incidence	Interval	Incidence	Interval	Interval	Source	Source
7.58E-01	37	2.82E+01	2.34E-04	6.29E-06	2.73E-05	1,190,000	2.07E+03	0.0002	4,100.	369	ECOLOTEC	DAYTO				
7.44E-01	1	8.29E-01	6.88E-06	6.17E-06	1.62E-05	248,000	3.85E+01	<0.0001	220,000.	211	HILL PETROLEUM	ST. R				
7.34E-01	<1	5.72E-02	4.75E-07	6.09E-06	2.95E-05	3,430,000	7.32E+02	0.0001	12,000.	62	DUPONT	DEEPW				
7.32E-01	1	4.35E-01	3.61E-06	6.08E-06	4.52E-05	495,000	1.12E+03	0.0001	7,500.	274	EL PASO REFINING	EL PA				
7.14E-01	1	5.80E-01	4.81E-06	5.93E-06	1.06E-04	2,450,000	2.49E+03	0.0003	3,400.	284	LYONDELL PETROCHEM	HOUST				
7.07E-01	2	1.11E+00	9.19E-06	5.87E-06	2.01E-05	2,110,000	3.61E+02	<0.0001	23,000.	398	DELAWARE CONTAINERS	COATS				
7.00E-01	1	4.94E-01	4.10E-06	5.81E-06	2.37E-05	253,000	5.14E+01	<0.0001	160,000.	220	CRYSTAL REF.	CARSO				
6.79E-01	14	9.24E+00	7.67E-05	5.64E-06	1.08E-05	12,200,000	2.34E+03	0.0003	3,600.	235	AMERADA-HESS	PORT				
6.63E-01	<1	2.58E-01	2.14E-06	5.50E-06	2.12E-05	551,000	9.56E+01	<0.0001	88,000.	36	DOW CHEMICAL	PLAQU				
6.54E-01	46	3.00E+01	2.49E-04	5.43E-06	4.32E-06	338,000	6.43E+02	0.0001	13,000.	294	TRIFINERY	CORPU				
6.42E-01	265	1.70E+02	1.41E-03	5.33E-06	9.39E-05	8,730,000	1.32E+04	0.0016	640.	156	GOLDEN WEST REFINING	SANTA				
6.33E-01	<1	2.10E-01	1.75E-06	5.25E-06	1.92E-05	790,000	3.67E+02	<0.0001	23,000.	322	KOPPERS	WOODW				
6.18E-01	<1	3.19E-02	2.64E-07	5.13E-06	2.43E-05	1,220,000	1.84E+02	<0.0001	46,000.	10	STANDARD CHLORIDE CH	DELAW				
6.11E-01	48	2.96E+01	2.45E-04	5.07E-06	2.77E-05	2,760,000	9.93E+02	0.0001	8,500.	157	HUNTWAY REF.	BENEC				
5.95E-01	<1	8.83E-03	7.33E-08	4.93E-06	2.85E-05	3,380,000	5.33E+02	0.0001	16,000.	388	MICHIGAN DISPOSAL IN	BELLE				
5.83E-01	16	9.44E+00	7.84E-05	4.84E-06	4.09E-06	1,230,000	1.54E+02	<0.0001	55,000.	4	ALPHA RESINS	FERRI				
5.79E-01	1	8.33E-01	6.91E-06	4.80E-06	3.38E-05	707,000	3.78E+02	<0.0001	22,000.	47	PARKE-DAVIS	HOLLA				
5.79E-01	1	3.49E-01	2.90E-06	4.80E-06	2.49E-05	4,490,000	6.59E+02	0.0001	13,000.	239	MANTUA OIL	THORO				
5.23E-01	1	2.95E-01	2.45E-06	4.34E-06	1.56E-05	772,000	2.47E+02	<0.0001	34,000.	124	UNION CARBIDE CORP	TEXAS				
5.12E-01	265	1.36E+02	1.13E-03	4.25E-06	7.49E-05	8,730,000	1.05E+04	0.0012	800.	166	POWERINE OIL	SANTA				
5.01E-01	44	2.22E+01	1.84E-04	4.16E-06	3.31E-05	424,000	4.76E+02	0.0001	18,000.	332	ARMCO INC.	ASHLA				
4.82E-01	<1	4.12E-02	3.42E-07	4.00E-06	1.35E-05	574,000	6.16E+01	<0.0001	140,000.	39	RUBICON CHEMICALS IN	GEISM				
4.74E-01	<1	1.32E-02	1.09E-07	3.94E-06	7.94E-06	925,000	2.04E+02	<0.0001	41,000.	393	PETROCHEM RECYCLING	SALT				
4.60E-01	<1	6.95E-03	5.77E-08	3.82E-06	1.84E-05	4,450,000	7.40E+02	0.0001	11,000.	67	MONSANTO CO	BRIDG				
4.41E-01	10	4.47E+00	3.71E-05	3.66E-06	2.27E-05	2,070,000	3.90E+02	<0.0001	22,000.	87	ATLANTIC RICHFIELD C	MONAC				
4.31E-01	3	1.30E+00	1.08E-05	3.58E-06	5.52E-05	364,000	3.29E+02	<0.0001	26,000.	277	FINA OIL & CHEMICAL	PORT				
4.30E-01	<1	1.74E-02	1.44E-07	3.57E-06	1.88E-05	279,000	1.52E+02	<0.0001	56,000.	180	AMOCO	SAVAN				
4.21E-01	28	1.17E+01	9.71E-05	3.50E-06	4.34E-04	455,000	1.55E+03	0.0002	5,400.	74	MONTROSE CHEMICAL CO	HENDE				
4.17E-01	1	2.80E-01	2.32E-06	3.46E-06	1.31E-05	511,000	1.63E+02	<0.0001	52,000.	46	DOW CORNING	MIDLA				
4.08E-01	1	2.39E-01	1.98E-06	3.38E-06	1.12E-05	278,000	1.68E+01	<0.0001	500,000.	20	GOODRICH, (B.F.)	HENRY				
3.87E-01	<1	1.11E-01	9.23E-07	3.21E-06	1.39E-05	6,100,000	7.95E+02	0.0001	11,000.	368	CHEM. WASTE MGMT.	CALUM				
3.73E-01	4	1.32E+00	1.10E-05	3.10E-06	1.73E-05	3,810,000	5.67E+02	0.0001	15,000.	350	DETROIT COKE	DETRI				
3.67E-01	6	2.27E+00	1.89E-05	3.05E-06	1.31E-05	6,100,000	8.21E+02	0.0001	10,000.	327	LTV STEEL	S CHI				
3.62E-01	20	7.31E+00	6.07E-05	3.01E-06	1.22E-05	807,000	5.01E+02	0.0001	17,000.	324	SLOSS INDUSTRIES	BIRMI				
3.59E-01	54	1.95E+01	1.61E-04	2.98E-06	1.28E-05	6,210,000	1.31E+03	0.0002	6,400.	326	ACME STEEL	CHICA				
3.58E-01	16	5.57E+00	4.62E-05	2.97E-06	6.58E-05	287,000	3.18E+02	<0.0001	27,000.	223	TOTAL PETROLEUM	ALMA				
3.54E-01	17	6.13E+00	5.09E-05	2.94E-06	1.53E-05	2,180,000	5.37E+02	0.0001	16,000.	325	NATIONAL STEEL	GRANI				
3.52E-01	49	1.72E+01	1.43E-04	2.92E-06	1.29E-05	1,670,000	9.11E+02	0.0001	9,300.	383	CECOS INT'L	CINCI				
3.51E-01	<1	5.38E-02	4.47E-07	2.92E-06	7.40E-06	4,900,000	3.56E+02	<0.0001	24,000.	58	BASF WYANDOTTE CORP.	JAMES				
3.32E-01	<1	1.56E-01	1.29E-06	2.76E-06	1.51E-05	1,000,000	2.15E+02	<0.0001	39,000.	337	LTV STEEL	WARRE				
3.32E-01	1	1.88E-01	1.56E-06	2.75E-06	1.49E-05	1,150,000	2.57E+02	<0.0001	33,000.	129	ATLANTIC WOOD INDUST	PORTS				
3.30E-01	9	2.94E+00	2.44E-05	2.74E-06	4.84E-06	1,240,000	1.96E+02	<0.0001	43,000.	335	TONAWANDA	TONAW				
3.27E-01	2	5.06E-01	4.20E-06	2.71E-06	1.17E-05	4,400,000	2.88E+02	<0.0001	29,000.	331	U.S. STEEL CORP.	GARY				
3.10E-01	<1	6.78E-02	5.63E-07	2.57E-06	6.69E-05	924,000	1.91E+03	0.0002	4,400.	265	MAPCO PETROLEUM	MEMPH				
3.09E-01	1	3.02E-01	2.51E-06	2.57E-06	7.28E-06	1,270,000	9.45E+01	<0.0001	89,000.	71	SOUTHLAND CORP.	GREAT				

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TABLE D-6. (continued)

Summary for BENZENE
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- M a x i m u m -					- - M i n i m u m - - -					S o u r c e	
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval		
3.08E-01	54	1.65E+01	1.37E-04	2.56E-06	8.41E-06	562,000	3.75E+02	<0.0001	22,000.	334	NATIONAL STEEL GROUP ECORS
3.05E-01	1	4.25E-01	3.53E-06	2.53E-06	1.05E-05	297,000	9.69E+01	<0.0001	87,000.	339	NEW BOSTON COKE PORTS
3.04E-01	<1	1.26E-02	1.04E-07	2.53E-06	8.94E-06	346,000	2.08E+01	<0.0001	1410,000.	355	HANSBROUGH ENERGY CROWL
3.00E-01	15	4.47E+00	3.71E-05	2.49E-06	1.54E-05	2,410,000	8.28E+02	0.0001	10,000.	345	SHENANGO SHENA
2.98E-01	44	1.30E+01	1.08E-04	2.47E-06	7.36E-05	8,180,000	1.05E+04	0.0012	800.	147	ATLANTIC RICHFIELD CARSO
2.82E-01	4	1.14E+00	9.43E-06	2.34E-06	5.58E-06	8,320,000	7.17E+02	0.0001	12,000.	72	STAUFFER CHEMICAL CO EDISO
2.78E-01	3	7.48E-01	6.21E-06	2.31E-06	1.50E-05	1,190,000	6.27E+02	0.0001	13,000.	329	CITIZENS GAS INDIA
2.68E-01	2	4.07E-01	3.38E-06	2.23E-06	3.91E-05	935,000	7.64E+02	0.0001	11,000.	299	CHEVRON SALT
2.59E-01	<1	5.83E-02	4.84E-07	2.15E-06	1.15E-04	626,000	1.97E+03	0.0002	4,300.	254	SUN REFINING TULSA
2.53E-01	1	3.15E-01	2.61E-06	2.10E-06	6.60E-06	313,000	2.74E+01	<0.0001	310,000.	51	FIRST CHEMICAL CORP PASCA
2.50E-01	35	8.76E+00	7.27E-05	2.08E-06	2.12E-05	2,910,000	1.14E+03	0.0001	7,400.	173	TOSCO CORP. MARTI
2.41E-01	<1	3.96E-02	3.29E-07	2.00E-06	1.55E-05	168,000	1.06E+01	<0.0001	1800,000.	12	OLIN CORP. ST. M
2.17E-01	3	7.12E-01	5.91E-06	1.80E-06	4.79E-06	834,000	5.99E+01	<0.0001	1140,000.	11	ALPHA CHEMICAL LAKEL
2.08E-01	17	3.59E+00	2.98E-05	1.73E-06	1.08E-05	2,390,000	4.33E+02	0.0001	19,000.	88	CALGON CARBON NEVIL
2.07E-01	12	2.55E+00	2.12E-05	1.72E-06	7.76E-06	2,110,000	1.89E+02	<0.0001	45,000.	347	SHARON STEEL MONES
2.06E-01	35	7.19E+00	5.97E-05	1.71E-06	3.66E-06	2,540,000	3.16E+02	<0.0001	27,000.	116	HEAT ENERGY TECH. DALLA
2.06E-01	163	3.36E+01	2.79E-04	1.71E-06	1.08E-04	2,640,000	4.19E+03	0.0005	2,000.	112	GEORGIA-PACIFIC CORP PASAD
1.98E-01	2	2.99E-01	2.48E-06	1.64E-06	5.79E-06	399,000	3.33E+01	<0.0001	250,000.	109	E I DUPONT DE NEMOUR ORANG
1.95E-01	497	9.70E+01	8.05E-04	1.62E-06	9.22E-05	189,000	8.73E+02	0.0001	9,700.	321	EMPIRE COKE COMPANY TUSCA
1.74E-01	2	4.32E-01	3.59E-06	1.44E-06	7.52E-06	4,790,000	3.52E+02	<0.0001	24,000.	61	DUPONT GIBBS
1.73E-01	<1	3.91E-02	3.25E-07	1.44E-06	3.31E-06	428,000	2.61E+01	<0.0001	320,000.	30	VULCAN MATERIALS WICHI
1.71E-01	1	1.40E-01	1.16E-06	1.42E-06	4.90E-06	158,000	1.47E+01	<0.0001	1570,000.	101	CAIN CHEMICAL BRAZO
1.70E-01	1	9.84E-02	8.16E-07	1.41E-06	5.41E-06	42,300	4.50E+00	<0.0001	*****	104	COSDEN OIL & CHEMICA BIG S
1.59E-01	6	9.49E-01	7.88E-06	1.32E-06	4.37E-06	297,000	4.05E+01	<0.0001	210,000.	53	REICHOLD CHEMICALS GULFP
1.54E-01	705	1.08E+02	9.00E-04	1.28E-06	1.95E-04	2,210,000	4.20E+03	0.0005	2,000.	275	EXXON CORP BAYTO
1.54E-01	7	1.12E+00	9.32E-06	1.27E-06	2.02E-04	349,000	8.14E+02	0.0001	10,000.	269	CHEVRON PORT
1.50E-01	28	4.19E+00	3.47E-05	1.24E-06	5.21E-06	2,340,000	3.42E+02	<0.0001	25,000.	89	KOPPERS CO INC BRIDG
1.45E-01	54	7.88E+00	6.54E-05	1.20E-06	1.99E-06	1,940,000	2.14E+02	<0.0001	39,000.	381	CECOS STAMF
1.23E-01	1	1.34E-01	1.11E-06	1.02E-06	6.86E-06	372,000	4.04E+01	<0.0001	210,000.	16	NIPRO, INC. AUGUS
1.15E-01	22	2.56E+00	2.12E-05	9.55E-07	3.07E-06	93,500	3.09E+01	<0.0001	270,000.	353	ENSCO EL DO
1.13E-01	24	2.66E+00	2.20E-05	9.35E-07	2.59E-05	2,440,000	5.64E+02	0.0001	15,000.	333	BETHLEHEM STEEL CORP SPARR
1.11E-01	10	1.11E+00	9.20E-06	9.20E-07	1.34E-06	13,300,000	7.73E+02	0.0001	11,000.	73	TROY CHEMICAL CORP., NEWAR
1.05E-01	38	4.00E+00	3.32E-05	8.71E-07	2.34E-06	2,600,000	1.74E+02	<0.0001	48,000.	122	S.D.S. BIOTECH CORP. HOUST
9.56E-02	2	2.16E-01	1.79E-06	7.93E-07	4.16E-06	826,000	6.92E+01	<0.0001	1120,000.	354	ENVIROSAFE SERVICES OREGO
9.16E-02	21	1.89E+00	1.57E-05	7.61E-07	1.44E-06	12,500,000	4.19E+02	0.0001	20,000.	66	MOBAY CORP. HALED
9.02E-02	70	6.33E+00	5.25E-05	7.49E-07	1.26E-06	12,900,000	5.68E+02	0.0001	15,000.	70	REICHOLD CHEMICALS ELIZA
8.97E-02	<1	1.81E-02	1.51E-07	7.45E-07	3.90E-05	2,560,000	9.91E+02	0.0001	8,500.	374	ROLLINS ENV. SERVICE DEER
8.19E-02	<1	1.82E-02	1.51E-07	6.80E-07	2.72E-06	103,000	1.98E+00	<0.0001	*****	372	ROGERS LANDFILL CENTR
7.46E-02	<1	3.32E-02	2.76E-07	6.19E-07	4.34E-07	364,000	8.92E+00	<0.0001	1950,000.	117	KOCH INDUSTRIES CORPU
7.39E-02	1	3.73E-02	3.09E-07	6.14E-07	2.25E-06	223,000	2.18E+01	<0.0001	390,000.	42	VISTA CHEMICAL WESTL
7.21E-02	106	7.65E+00	6.35E-05	5.98E-07	2.39E-05	1,270,000	1.05E+03	0.0001	8,000.	336	BETHLEHEM STEEL LACKA
7.06E-02	<1	7.52E-02	6.24E-08	5.86E-07	6.85E-05	4,870,000	6.82E+03	0.0008	1,200.	258	CHEVRON PHILA
5.93E-02	80	4.72E+00	3.92E-05	4.92E-07	1.21E-06	9,100,000	2.36E+02	<0.0001	36,000.	6	LILLY COATINGS MONTE
5.67E-02	<1	7.55E-02	6.27E-08	4.70E-07	1.90E-06	1,800,000	2.38E+01	<0.0001	350,000.	48	3-M COMPANY COTTA
5.17E-02	723	3.73E+01	3.10E-04	4.29E-07	3.41E-05	92,400	3.09E+02	<0.0001	27,000.	251	CONOCO PONCA

TABLE D-6. (continued)

Summary for BENZENE
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REFINERIES

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CAS=

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- M a x i m u m -					- - M i n i m u m - -					Annual Repeat			S o u r c e	
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Incidence	Interval					
4.82E-02	<1	2.69E-03	2.24E-08	4.00E-07	4.71E-07	2,520,000	9.26E+00	<0.0001	910,000.	377	IT CORPORATION	BENEC		
4.54E-02	2	7.43E-02	6.16E-07	3.77E-07	1.56E-06	1,570,000	3.31E+01	<0.0001	1250,000.	82	MONSANTO CO	ADDYS		
4.31E-02	8	3.35E-01	2.78E-06	3.57E-07	6.24E-07	2,060,000	3.54E+01	<0.0001	1240,000.	9	UPJOHN CO.,THE	NORTH		
4.24E-02	<1	5.14E-03	4.26E-08	3.52E-07	3.49E-07	309,000	2.82E+00	<0.0001	*****	2	MONSANTO CO	ANNIS		
3.73E-02	13	4.85E-01	4.03E-06	3.10E-07	3.84E-06	2,580,000	5.67E+01	<0.0001	1150,000.	78	NEPERA CHEMICAL CO.,	HARRI		
3.37E-02	<1	7.62E-03	6.32E-08	2.79E-07	6.12E-07	425,000	4.22E+00	<0.0001	*****	29	AIR PRODUCTS & CHEM.	WICHI		
3.14E-02	10	2.98E-01	2.48E-06	2.61E-07	1.85E-05	2,690,000	9.11E+02	0.0001	9,300.	100	ATLANTIC RICHFIELD	HOUST		
2.69E-02	7	1.83E-01	1.52E-06	2.23E-07	8.52E-07	2,680,000	4.56E+01	<0.0001	1180,000.	118	KOPPERS	HOUST		
2.49E-02	2	4.60E-02	3.82E-07	2.07E-07	4.35E-07	3,100,000	4.77E+01	<0.0001	1180,000.	364	CHEM-CLEAR INC.	BALTI		
2.44E-02	<1	4.12E-03	3.42E-08	2.03E-07	4.64E-07	2,540,000	3.63E+01	<0.0001	1230,000.	365	CHEM-CLEAR INC.	CLEVE		
1.81E-02	20	3.66E-01	3.04E-06	1.50E-07	4.52E-06	333,000	7.30E+01	<0.0001	1120,000.	344	ERIE COKE	ERIE		
1.72E-02	<1	3.93E-05	3.27E-10	1.43E-07	5.97E-07	1,260,000	3.24E+00	<0.0001	*****	41	UNION CARBIDE CORP.	HAHNV		
1.70E-02	17	2.96E-01	2.46E-06	1.41E-07	9.45E-07	1,150,000	2.29E+01	<0.0001	1370,000.	376	HERITAGE ENV. SERVIC	INDIA		
1.63E-02	<1	4.49E-03	3.73E-08	1.36E-07	4.76E-07	1,730,000	2.68E+00	<0.0001	*****	23	REILLY TAR AND CHEM	GRANI		
1.59E-02	<1	7.74E-04	6.43E-09	1.32E-07	2.81E-07	2,240,000	8.58E+00	<0.0001	1980,000.	115	GOODYEAR TIRE & RUBB	LAPOR		
1.45E-02	10	1.38E-01	1.14E-06	1.20E-07	6.78E-07	4,250,000	4.13E+01	<0.0001	1200,000.	366	CHEM-MET SERVICES	WYAND		
1.42E-02	23	3.27E-01	2.71E-06	1.18E-07	8.21E-05	547,000	2.73E+02	<0.0001	31,000.	219	STAR REF.	CONVE		
1.35E-02	<1	3.07E-03	2.54E-08	1.12E-07	2.46E-07	425,000	1.70E+00	<0.0001	*****	28	ABBOTT LABORATORIES	WICHI		
1.24E-02	54	6.73E-01	5.59E-06	1.03E-07	1.70E-07	1,940,000	1.83E+01	<0.0001	1460,000.	382	CECOS INT'L	BRIST		
1.15E-02	230	2.64E+00	2.19E-05	9.54E-08	3.76E-05	2,360,000	2.95E+02	<0.0001	29,000.	328	BETHLEHEM STEEL	BURNS		
1.08E-02	7	7.05E-02	5.85E-07	8.93E-08	3.39E-07	708,000	5.70E+00	<0.0001	*****	99	AMOCO CHEMICAL	TEXAS		
1.01E-02	1	1.05E-02	8.73E-08	8.35E-08	4.39E-07	189,000	8.82E-01	<0.0001	*****	33	GAF CORP.	CALVE		
9.75E-03	360	3.51E+00	2.91E-05	8.10E-08	7.21E-05	76,500	5.10E+01	<0.0001	1170,000.	139	MAPCO PETROLEUM	NORTH		
9.10E-03	<1	2.61E-03	2.17E-08	7.55E-08	3.26E-07	6,100,000	1.87E+01	<0.0001	1450,000.	363	CID-LANDFILL	CALUM		
8.15E-03	233	1.90E+00	1.58E-05	6.76E-08	1.70E-04	284,000	2.54E+02	<0.0001	33,000.	226	CHEVRON	PASCA		
7.99E-03	1	8.26E-03	6.86E-08	6.63E-08	2.76E-07	415,000	1.01E+00	<0.0001	*****	85	USS CHEMICAL	IRONT		
7.61E-03	1	5.00E-03	4.15E-08	6.32E-08	4.47E-07	649,000	2.02E+00	<0.0001	*****	54	MALLINCKRODT CHEM.	RALEI		
7.30E-03	845	6.17E+00	5.12E-05	6.06E-08	4.02E-05	158,000	6.27E+01	<0.0001	1130,000.	261	QUAKER STATE OIL REF	SMETH		
7.21E-03	28	2.00E-01	1.66E-06	5.99E-08	1.02E-07	1,170,000	7.93E+00	<0.0001	*****	370	FRONTIER CHEMICAL	NIAGR		
6.79E-03	387	2.63E+00	2.18E-05	5.63E-08	1.22E-04	27,100	3.34E+01	<0.0001	1250,000.	272	DIAMOND SHAMROCK	SUNRA		
6.61E-03	360	2.38E+00	1.98E-05	5.49E-08	4.89E-05	76,500	3.46E+01	<0.0001	1240,000.	140	PETRO STAR	NORTH		
6.57E-03	1	8.94E-03	7.42E-08	5.45E-08	4.04E-08	328,000	5.82E-01	<0.0001	*****	102	CELANESE CHEMICAL	BISHO		
6.55E-03	2	1.38E-02	1.14E-07	5.44E-08	1.26E-07	1,970,000	3.63E+00	<0.0001	*****	81	BF GOODRICH	AVON		
6.54E-03	<1	3.30E-04	2.74E-09	5.43E-08	1.77E-07	469,000	8.21E-01	<0.0001	*****	18	NORCHEM CO.	CLINT		
6.07E-03	15	8.97E-02	7.44E-07	5.04E-08	1.66E-07	804,000	7.32E+00	<0.0001	*****	1	ALLIED SIGNAL	BIRMI		
6.02E-03	163	9.83E-01	8.16E-06	5.00E-08	3.14E-06	2,640,000	1.22E+02	<0.0001	69,000.	111	GEORGIA GULF CORP.	PASAD		
5.66E-03	525	2.97E+00	2.46E-05	4.69E-08	2.51E-05	406,000	2.60E+02	<0.0001	32,000.	134	HUNT REFINING	TUSCA		
5.31E-03	491	2.61E+00	2.16E-05	4.41E-08	7.05E-05	221,000	8.39E+01	<0.0001	1100,000.	206	CANAL REF.	CHURC		
4.52E-03	1	3.07E-03	2.54E-08	3.75E-08	4.87E-08	2,000,000	1.12E+00	<0.0001	*****	5	DOW CHEMICAL	PITTS		
4.06E-03	57	2.32E-01	1.93E-06	3.37E-08	4.16E-06	824,000	4.00E+01	<0.0001	1210,000.	128	HERCULES	MAGNA		
4.04E-03	77	3.11E-01	2.58E-06	3.35E-08	1.35E-06	2,210,000	6.93E+01	<0.0001	1120,000.	50	MONSANTO CO	ST. L		
3.39E-03	175	5.94E-01	4.93E-06	2.82E-08	2.39E-05	60,000	3.56E+01	<0.0001	1240,000.	242	GIANT REFINERY	GALLU		
2.89E-03	1	1.84E-02	1.53E-08	2.40E-08	8.39E-08	113,000	1.44E-01	<0.0001	*****	3	GREAT LAKES CHEMICAL	EL DO		
2.62E-03	50	1.31E-01	1.09E-06	2.18E-08	7.30E-05	354,000	1.34E+02	<0.0001	63,000.	210	HILL PETROLEUM	KROTZ		
2.58E-03	22	5.67E-02	4.71E-07	2.14E-08	2.46E-04	34,800	1.45E+01	<0.0001	1580,000.	138	CHEVRON	KENAI		

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TABLE D-6. (continued)

Summary for BENZENE
with a Unit Risk of 8.30E-06

REFINERIES

SIC=

CAS=

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- M a x i m u m -					- - M i n i m u m - -					S o u r c e	
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval		
2.39E-03	1	1.37E-03	1.14E-08	1.99E-08	8.63E-08	395,000	5.98E-01	<0.0001*****	120	MOBIL CHEMICALS	BEAUM
2.15E-03	598	1.29E+00	1.07E-05	1.79E-08	2.67E-05	108,000	1.62E+01	<0.0001520,000.	143	BERRY PETROLEUM	STEVE
2.15E-03	11	2.34E-02	1.94E-07	1.79E-08	5.84E-08	902,000	4.91E+00	<0.0001*****	76	EASTMAN KODAK	ROCHE
2.07E-03	4	8.25E-03	6.85E-08	1.71E-08	2.13E-08	2,090,000	2.07E+00	<0.0001*****	361	CHEMICAL PROCESSORS	SEATT
2.00E-03	109	2.18E-01	1.81E-06	1.66E-08	2.67E-05	25,100	5.34E+00	<0.0001*****	197	FARMLAND FACILITIES	PHILL
1.93E-03	<1	1.60E-04	1.33E-09	1.60E-08	3.61E-08	200,000	3.89E-02	<0.0001*****	19	CLARK OIL & REFINING	BLUE
1.89E-03	<1	1.35E-04	1.12E-09	1.57E-08	3.28E-08	2,590,000	9.27E-01	<0.0001*****	113	GLIDDEN COATINGS	CARRO
1.83E-03	23	4.21E-02	3.50E-07	1.52E-08	5.01E-05	24,400	6.87E+00	<0.0001*****	250	BARRETT REF.	THOMA
1.81E-03	<1	2.08E-06	1.73E-11	1.50E-08	1.05E-07	362,000	3.08E-01	<0.0001*****	17	OLIN CHEMICALS	AUGUS
1.40E-03	2	2.63E-03	2.19E-08	1.16E-08	4.02E-08	386,000	1.84E-01	<0.0001*****	114	GOODYEAR TIRE	BEAUM
1.36E-03	1	1.74E-03	1.44E-08	1.13E-08	7.05E-08	294,000	1.33E-01	<0.0001*****	25	US INDUSTRIAL CHEM.	TUSCO
1.28E-03	<1	3.87E-04	3.21E-09	1.06E-08	8.93E-08	12,700,000	2.10E+01	<0.0001400,000.	56	AMERICAN CYANAMID CO	LINDE
1.24E-03	10	1.24E-02	1.03E-07	1.03E-08	1.49E-08	13,300,000	8.62E+00	<0.0001980,000.	68	ORBIS PRODUCTS CORP	NEWAR
1.23E-03	22	2.70E-02	2.24E-07	1.02E-08	1.17E-04	34,800	6.88E+00	<0.0001*****	141	TESARO ALASKA PETROL	KENAI
1.11E-03	14	1.52E-02	1.26E-07	9.25E-09	4.02E-08	435,000	1.17E+00	<0.0001*****	79	ALLIED CHEMICAL	IRONT
9.95E-04	4	4.30E-03	3.57E-08	8.26E-09	4.07E-08	483,000	2.64E-01	<0.0001*****	96	US ARMY MUNITIONS	KINGS
9.48E-04	1	6.16E-04	5.11E-09	7.87E-09	3.47E-07	2,450,000	9.70E+00	<0.0001870,000.	125	UPJOHN CO	LA PO
8.82E-04	1,150	1.02E+00	8.45E-06	7.32E-09	5.72E-05	34,300	9.49E+00	<0.0001890,000.	243	NAVAJO REFINING	ARTES
8.09E-04	33	2.67E-02	2.22E-07	6.71E-09	1.00E-04	6,710	1.91E+00	<0.0001*****	142	INTERMOUNTAIN REF.	FREDO
6.99E-04	22	1.54E-02	1.28E-07	5.80E-09	4.49E-04	252	1.19E-01	<0.0001*****	391	USPCI GRASSY MT.	KNOWL
6.64E-04	1,270	8.46E-01	7.02E-06	5.51E-09	3.28E-07	556,000	6.00E+00	<0.0001*****	40	STAUFFER CHEMICAL	BATON
6.63E-04	601	3.99E-01	3.31E-06	5.50E-09	4.31E-06	357,000	9.51E+00	<0.0001890,000.	356	ENV. ENTERPRISES	CINCI
5.97E-04	<1	1.02E-04	8.45E-10	4.95E-09	8.45E-09	300,000	3.02E-02	<0.0001*****	14	DOW CHEMICAL	DALTO
5.91E-04	36	2.11E-02	1.75E-07	4.90E-09	3.09E-08	415,000	8.74E-01	<0.0001*****	26	MEAD JOHNSON	EVANS
5.61E-04	4	2.27E-03	1.88E-08	4.65E-09	9.27E-07	2,580,000	2.65E+01	<0.0001320,000.	106	DIAMOND SHAMROCK COR	DEER
4.78E-04	170	8.13E-02	6.75E-07	3.97E-09	1.46E-05	206,000	1.89E+01	<0.0001450,000.	379	CASMALIA RESOURCES	CASMA
4.58E-04	5	2.19E-03	1.82E-08	3.80E-09	7.69E-09	12,500,000	1.64E+00	<0.0001*****	358	SOLVENT RECOV. SERVI	LINDE
3.98E-04	1,450	5.76E-01	4.78E-06	3.30E-09	1.28E-05	432,000	3.12E+01	<0.0001270,000.	133	BELCHER REF.	MOBIL
3.68E-04	38	1.40E-02	1.16E-07	3.05E-09	6.57E-09	613,000	4.08E-01	<0.0001*****	362	CHEMICAL RESOURCES	TULSA
3.44E-04	12	4.00E-03	3.32E-08	2.86E-09	5.91E-09	2,610,000	3.44E-01	<0.0001*****	119	LILLY IND. COATINGS	DALLA
2.85E-04	860	2.45E-01	2.04E-06	2.37E-09	3.08E-06	89,200	2.33E+00	<0.0001*****	378	IT CORPORATION	WESTM
2.59E-04	1,850	4.80E-01	3.98E-06	2.15E-09	2.37E-06	551,000	4.63E+00	<0.0001*****	38	GEORGIA-PACIFIC CORP	PLAQU
2.54E-04	2,170	5.50E-01	4.56E-06	2.11E-09	8.84E-06	281,000	1.74E+01	<0.0001490,000.	13	ATLANTIC WOOD INDUST	SAVAN
2.42E-04	1,980	4.78E-01	3.96E-06	2.01E-09	4.74E-06	180,000	5.53E+00	<0.0001*****	95	RHONE-POULENC, INC.	MT. P
2.37E-04	<1	6.08E-05	5.05E-10	1.96E-09	3.32E-09	573,000	8.30E-02	<0.0001*****	8	DOW CHEMICAL	LEDYA
2.06E-04	24	4.91E-03	4.07E-08	1.71E-09	2.79E-09	5,190,000	2.98E-01	<0.0001*****	55	AMERICAN CYANAMID	BRIDG
1.40E-04	4	6.00E-04	4.98E-09	1.16E-09	6.63E-09	1,780,000	1.66E-01	<0.0001*****	83	PPG INDUSTRIES	NORTO
1.39E-04	<1	3.88E-06	3.22E-11	1.16E-09	6.92E-09	460,000	2.10E-02	<0.0001*****	93	DUPONT	LUGOP
1.31E-04	1	6.70E-05	5.56E-10	1.09E-09	5.58E-09	4,810,000	2.61E-01	<0.0001*****	63	HERCULES	GBBS
1.28E-04	5	5.99E-04	4.97E-09	1.06E-09	5.67E-09	2,200,000	2.21E-01	<0.0001*****	21	MONSANTO CO	SAUGE
1.21E-04	489	5.90E-02	4.90E-07	1.00E-09	3.47E-05	536	6.06E-02	<0.0001*****	234	NEVADA REF.	TONOP
1.17E-04	5	5.85E-04	4.85E-09	9.72E-10	1.23E-09	1,330,000	1.17E-01	<0.0001*****	351	COMMERCIAL DISPOSAL	WEST
1.14E-04	29	3.31E-04	2.75E-08	9.50E-10	1.36E-09	13,800,000	1.54E+00	<0.0001*****	360	CALLEIA RES. RECOVER	BROOK
1.02E-04	681	6.96E-02	5.77E-07	8.48E-10	8.09E-07	163,000	8.87E-01	<0.0001*****	75	AYERST LABS	ROUSE
8.31E-05	769	6.39E-02	5.31E-07	6.90E-10	1.36E-06	118,000	6.53E-01	<0.0001*****	52	KERR-MCGEE CHEM. COR	MERID

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TABLE D-6. (continued)

Summary for BENZENE REFINERIES
with a Unit Risk of $8.30E-06$

SIC= CAS=

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- M a x i m u m -					- - M i n i m u m - -					S o u r c e	
Conc	People	Exposure	Lifetime Incidence	Max Risk	Conc	People	Exposure	Annual Incidence	Repeat Interval		
7.45E-05	<1	1.28E-06	1.06E-11	6.18E-10	3.63E-09	3,440,000	6.67E-02	<0.0001*****		396 WAYNE DISPOSAL	BELLE
7.30E-05	2	1.80E-04	1.49E-09	6.06E-10	2.96E-09	4,570,000	1.09E-01	<0.0001*****		373 ROLLINS ENV. SERVICE	BRIDG
2.74E-05	1,310	3.58E-02	2.97E-07	2.27E-10	5.73E-07	423,000	1.72E+00	<0.0001*****		392 PEORIA DISPOSAL CO.	PEORI
2.48E-05	43	1.07E-03	8.86E-09	2.06E-10	1.07E-07	87,400	2.25E-01	<0.0001*****		123 UNION CARBIDE	SEADR
6.62E-06	203	1.34E-03	1.12E-08	5.49E-11	8.13E-08	552,000	2.07E-01	<0.0001*****		37 ETHYL CORP.	BATON
1.00E-38		0.00E+00	0.00E+00	0.00E+00	1.00E+38		0.00E+00			130 ALDRICH CHEMICALS	MILWA
1.00E-38		0.00E+00	0.00E+00	0.00E+00	1.00E+38		0.00E+00			136 ARCO ALASKA	KUPAR
					701,000,000 5.70E+05 0.068 15.					O v e r a l l	

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TABLE D-7. POPULATION EXPOSURE RESULTS FOR CASE 1 (BASELINE MINIMUM)

Page 1

Summary for BENZENE REFINERIES SIC= CAS=
 Maximum Radius = 50.0 Km

Level	Concentration	Population	Exposure
1	1.68E+02	<1	3.58E+01
2	1.00E+02	49	5.65E+03
3	5.00E+01	156	1.22E+04
4	2.50E+01	493	2.28E+04
5	1.00E+01	2,220	4.79E+04
6	5.00E+00	7,250	8.24E+04
7	2.50E+00	21,900	1.32E+05
8	1.00E+00	78,000	2.16E+05
9	5.00E-01	193,000	2.96E+05
10	2.50E-01	404,000	3.70E+05
11	1.00E-01	1,150,000	4.83E+05
12	5.00E-02	2,770,000	5.93E+05
13	2.50E-02	6,120,000	7.09E+05
14	1.00E-02	18,200,000	8.91E+05
15	5.00E-03	42,100,000	1.06E+06
16	2.50E-03	85,100,000	1.21E+06
17	1.00E-03	170,000,000	1.34E+06
18	5.00E-04	239,000,000	1.39E+06
19	2.50E-04	301,000,000	1.42E+06
20	1.00E-04	380,000,000	1.43E+06
21	5.00E-05	434,000,000	1.43E+06
22	2.50E-05	475,000,000	1.43E+06
23	1.00E-05	525,000,000	1.44E+06
24	5.00E-06	559,000,000	1.44E+06
25	2.50E-06	580,000,000	1.44E+06
26	1.00E-06	601,000,000	1.44E+06
27	5.00E-07	617,000,000	1.44E+06
28	2.50E-07	629,000,000	1.44E+06
29	1.00E-07	647,000,000	1.44E+06
30	5.00E-08	664,000,000	1.44E+06
31	2.50E-08	675,000,000	1.44E+06
32	1.00E-08	690,000,000	1.44E+06
33	5.00E-09	699,000,000	1.44E+06
34	2.50E-09	701,000,000	1.44E+06
35	1.20E-09	701,000,000	1.44E+06

Using a Risk Factor of 3.30E-06

Level	Risk Level	Population	Hazard
1	1.39E-03	<1	2.97E-04
2	1.00E-03	20	2.16E-02
3	5.00E-04	97	7.51E-02
4	2.50E-04	286	1.43E-01
5	1.00E-04	1,590	3.39E-01
6	5.00E-05	5,380	5.96E-01
7	2.50E-05	17,300	9.92E-01

TABLE D-7. (continued)

8	1.00E-05	57,900	1.61E+00
9	5.00E-06	155,000	2.28E+00
10	2.50E-06	336,000	2.91E+00
11	1.00E-06	928,000	3.81E+00
12	5.00E-07	2,190,000	4.66E+00
13	2.50E-07	4,960,000	5.62E+00
14	1.00E-07	14,400,000	7.05E+00
15	5.00E-08	33,800,000	8.39E+00
16	2.50E-08	71,600,000	9.71E+00
17	1.00E-08	151,000,000	1.10E+01
18	5.00E-09	222,000,000	1.15E+01
19	2.50E-09	284,000,000	1.17E+01
20	1.00E-09	365,000,000	1.18E+01
21	5.00E-10	420,000,000	1.19E+01
22	2.50E-10	465,000,000	1.19E+01
23	1.00E-10	515,000,000	1.19E+01
24	5.00E-11	551,000,000	1.19E+01
25	2.50E-11	576,000,000	1.19E+01
26	1.00E-11	596,000,000	1.19E+01
27	5.00E-12	613,000,000	1.19E+01
28	2.50E-12	625,000,000	1.19E+01
29	1.00E-12	643,000,000	1.19E+01
30	5.00E-13	660,000,000	1.19E+01
31	2.50E-13	672,000,000	1.19E+01
32	1.00E-13	687,000,000	1.19E+01
33	5.00E-14	698,000,000	1.19E+01
34	2.50E-14	701,000,000	1.19E+01
35	9.93E-15	701,000,000	1.19E+01

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TABLE D-8. POPULATION EXPOSURE RESULTS FOR CASE 2 (BASELINE MAXIMUM)

Page 1

Summary for BENZENE
Maximum Radius = 50.0 Km

REFINERIES

SIC=

CAS=

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Level	Concentration	Population	Exposure
1	2.78E+02	1	2.81E+02
2	2.50E+02	1	2.81E+02
3	1.00E+02	577	8.21E+04
4	5.00E+01	3,040	2.56E+05
5	2.50E+01	8,890	4.55E+05
6	1.00E+01	34,300	8.22E+05
7	5.00E+00	77,100	1.12E+06
8	2.50E+00	170,000	1.44E+06
9	1.00E+00	580,000	2.05E+06
10	5.00E-01	1,580,000	2.73E+06
11	2.50E-01	3,710,000	3.47E+06
12	1.00E-01	11,200,000	4.60E+06
13	5.00E-02	25,100,000	5.55E+06
14	2.50E-02	55,800,000	6.61E+06
15	1.00E-02	135,000,000	7.85E+06
16	5.00E-03	211,000,000	8.40E+06
17	2.50E-03	288,000,000	8.68E+06
18	1.00E-03	359,000,000	8.80E+06
19	5.00E-04	399,000,000	8.83E+06
20	2.50E-04	435,000,000	8.84E+06
21	1.00E-04	472,000,000	8.85E+06
22	5.00E-05	496,000,000	8.85E+06
23	2.50E-05	517,000,000	8.85E+06
24	1.00E-05	554,000,000	8.85E+06
25	5.00E-06	574,000,000	8.85E+06
26	2.50E-06	588,000,000	8.85E+06
27	1.00E-06	611,000,000	8.85E+06
28	5.00E-07	624,000,000	8.85E+06
29	2.50E-07	637,000,000	8.85E+06
30	1.00E-07	654,000,000	8.85E+06
31	5.00E-08	668,000,000	8.85E+06
32	2.50E-08	680,000,000	8.85E+06
33	1.00E-08	694,000,000	8.85E+06
34	5.00E-09	700,000,000	8.85E+06
35	2.50E-09	701,000,000	8.85E+06
36	1.20E-09	701,000,000	8.85E+06

Using a Risk Factor of 8.30E-06

Level	Risk Level	Population	Hazard
1	2.30E-03	1	2.34E-03
2	1.00E-03	385	5.07E-01
3	5.00E-04	1,490	1.88E+00
4	2.50E-04	7,270	3.41E+00
5	1.00E-04	24,300	5.93E+00
6	5.00E-05	63,200	8.63E+00

TABLD D-8. (continued)

7	2.50E-05	138,000	1.12E+01
8	1.00E-05	451,000	1.58E+01
9	5.00E-06	1,190,000	2.09E+01
10	2.50E-06	2,990,000	2.71E+01
11	1.00E-06	9,050,000	3.62E+01
12	5.00E-07	20,000,000	4.37E+01
13	2.50E-07	45,500,000	5.26E+01
14	1.00E-07	116,000,000	6.35E+01
15	5.00E-08	190,000,000	6.88E+01
16	2.50E-08	268,000,000	7.16E+01
17	1.00E-08	347,000,000	7.29E+01
18	5.00E-09	389,000,000	7.33E+01
19	2.50E-09	426,000,000	7.34E+01
20	1.00E-09	465,000,000	7.35E+01
21	5.00E-10	490,000,000	7.35E+01
22	2.50E-10	511,000,000	7.35E+01
23	1.00E-10	547,000,000	7.35E+01
24	5.00E-11	570,000,000	7.35E+01
25	2.50E-11	585,000,000	7.35E+01
26	1.00E-11	606,000,000	7.35E+01
27	5.00E-12	621,000,000	7.35E+01
28	2.50E-12	634,000,000	7.35E+01
29	1.00E-12	650,000,000	7.35E+01
30	5.00E-13	665,000,000	7.35E+01
31	2.50E-13	677,000,000	7.35E+01
32	1.00E-13	692,000,000	7.35E+01
33	5.00E-14	699,000,000	7.35E+01
34	2.50E-14	701,000,000	7.35E+01
35	9.93E-15	701,000,000	7.35E+01

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TABLE D-9. POPULATION EXPOSURE RESULTS FOR CASE 3 (CONTROLLED MINIMUM)

Page 1

Summary for BENZENE
Maximum Radius = 50.0 Km

REFINERIES

SIC=

CAS=

Level	Concentration	Population	Exposure
1	4.51E+01		0.00E+00
2	2.50E+01		0.00E+00
3	1.00E+01		0.00E+00
4	5.00E+00		0.00E+00
5	2.50E+00	201	5.97E+02
6	1.00E+00	1,140	2.05E+03
7	5.00E-01	11,100	9.51E+03
8	2.50E-01	22,300	1.33E+04
9	1.00E-01	73,500	2.10E+04
10	5.00E-02	198,000	2.96E+04
11	2.50E-02	480,000	3.91E+04
12	1.00E-02	1,800,000	5.89E+04
13	5.00E-03	4,690,000	7.84E+04
14	2.50E-03	10,100,000	9.76E+04
15	1.00E-03	21,700,000	1.15E+05
16	5.00E-04	42,400,000	1.29E+05
17	2.50E-04	86,200,000	1.45E+05
18	1.00E-04	195,000,000	1.62E+05
19	5.00E-05	297,000,000	1.69E+05
20	2.50E-05	397,000,000	1.73E+05
21	1.00E-05	504,000,000	1.75E+05
22	5.00E-06	555,000,000	1.75E+05
23	2.50E-06	580,000,000	1.75E+05
24	1.00E-06	600,000,000	1.75E+05
25	5.00E-07	616,000,000	1.75E+05
26	2.50E-07	629,000,000	1.75E+05
27	1.00E-07	646,000,000	1.75E+05
28	5.00E-08	664,000,000	1.75E+05
29	2.50E-08	675,000,000	1.75E+05
30	1.00E-08	690,000,000	1.75E+05
31	5.00E-09	699,000,000	1.75E+05
32	2.50E-09	701,000,000	1.75E+05
33	1.20E-09	701,000,000	1.75E+05

Using a Risk Factor of 8.30E-06

Level	Risk Level	Population	Hazard
1	3.74E-04		0.00E+00
2	2.50E-04		0.00E+00
3	1.00E-04		0.00E+00
4	5.00E-05		0.00E+00
5	2.50E-05	64	1.71E-03
6	1.00E-05	873	1.45E-02
7	5.00E-06	3,260	7.08E-02
8	2.50E-06	12,900	1.03E-01
9	1.00E-06	56,600	1.59E-01

TABLE D-9. (continued)

Page 2

10	5.00E-07	156,000	2.27E-01
11	2.50E-07	370,000	3.00E-01
12	1.00E-07	1,390,000	4.52E-01
13	5.00E-08	3,530,000	5.98E-01
14	2.50E-08	8,530,000	7.74E-01
15	1.00E-08	18,500,000	9.27E-01
16	5.00E-09	34,800,000	1.04E+00
17	2.50E-09	71,700,000	1.17E+00
18	1.00E-09	170,000,000	1.32E+00
19	5.00E-10	269,000,000	1.39E+00
20	2.50E-10	371,000,000	1.43E+00
21	1.00E-10	486,000,000	1.45E+00
22	5.00E-11	544,000,000	1.45E+00
23	2.50E-11	575,000,000	1.45E+00
24	1.00E-11	596,000,000	1.45E+00
25	5.00E-12	613,000,000	1.45E+00
26	2.50E-12	625,000,000	1.45E+00
27	1.00E-12	642,000,000	1.45E+00
28	5.00E-13	660,000,000	1.45E+00
29	2.50E-13	672,000,000	1.45E+00
30	1.00E-13	687,000,000	1.45E+00
31	5.00E-14	698,000,000	1.45E+00
32	2.50E-14	701,000,000	1.45E+00
33	9.93E-15	701,000,000	1.45E+00

TABLE D-10. POPULATION EXPOSURE RESULTS FOR CASE 4 (CONTROLLED MAXIMUM)

Page 1

Summary for BENZENE REFINERIES SIC= CAS=
 Maximum Radius = 50.0 Km

Level	Concentration	Population	Exposure
1	8.12E+01		0.00E+00
2	5.00E+01		0.00E+00
3	2.50E+01		0.00E+00
4	1.00E+01		0.00E+00
5	5.00E+00	272	1.51E+03
6	2.50E+00	2,300	8.09E+03
7	1.00E+00	19,900	3.40E+04
8	5.00E-01	43,100	5.01E+04
9	2.50E-01	95,400	6.83E+04
10	1.00E-01	330,000	1.04E+05
11	5.00E-02	800,000	1.35E+05
12	2.50E-02	2,180,000	1.82E+05
13	1.00E-02	7,310,000	2.59E+05
14	5.00E-03	16,600,000	3.25E+05
15	2.50E-03	32,100,000	3.78E+05
16	1.00E-03	78,900,000	4.50E+05
17	5.00E-04	154,000,000	5.02E+05
18	2.50E-04	263,000,000	5.41E+05
19	1.00E-04	391,000,000	5.63E+05
20	5.00E-05	455,000,000	5.67E+05
21	2.50E-05	502,000,000	5.69E+05
22	1.00E-05	552,000,000	5.70E+05
23	5.00E-06	574,000,000	5.70E+05
24	2.50E-06	588,000,000	5.70E+05
25	1.00E-06	610,000,000	5.70E+05
26	5.00E-07	624,000,000	5.70E+05
27	2.50E-07	637,000,000	5.70E+05
28	1.00E-07	654,000,000	5.70E+05
29	5.00E-08	668,000,000	5.70E+05
30	2.50E-08	680,000,000	5.70E+05
31	1.00E-08	694,000,000	5.70E+05
32	5.00E-09	700,000,000	5.70E+05
33	2.50E-09	701,000,000	5.70E+05
34	1.20E-09	701,000,000	5.70E+05

Using a Risk Factor of 8.30E-06

Level	Risk Level	Population	Hazard
1	6.74E-04		0.00E+00
2	5.00E-04		0.00E+00
3	2.50E-04		0.00E+00
4	1.00E-04		0.00E+00
5	5.00E-05	45	2.64E-03
6	2.50E-05	1,180	4.84E-02
7	1.00E-05	18,100	2.48E-01
8	5.00E-06	35,700	3.82E-01

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TABLE D-10. (continued)

Page 2

9	2.50E-06	78,500	5.29E-01
10	1.00E-06	255,000	7.91E-01
11	5.00E-07	619,000	1.04E+00
12	2.50E-07	1,650,000	1.40E+00
13	1.00E-07	5,700,000	2.01E+00
14	5.00E-08	13,600,000	2.55E+00
15	2.50E-08	26,900,000	3.02E+00
16	1.00E-08	65,500,000	3.61E+00
17	5.00E-09	130,000,000	4.06E+00
18	2.50E-09	231,000,000	4.42E+00
19	1.00E-09	368,000,000	4.65E+00
20	5.00E-10	440,000,000	4.70E+00
21	2.50E-10	491,000,000	4.72E+00
22	1.00E-10	543,000,000	4.73E+00
23	5.00E-11	569,000,000	4.73E+00
24	2.50E-11	584,000,000	4.73E+00
25	1.00E-11	606,000,000	4.73E+00
26	5.00E-12	621,000,000	4.73E+00
27	2.50E-12	633,000,000	4.73E+00
28	1.00E-12	650,000,000	4.73E+00
29	5.00E-13	665,000,000	4.73E+00
30	2.50E-13	677,000,000	4.73E+00
31	1.00E-13	692,000,000	4.73E+00
32	5.00E-14	699,000,000	4.73E+00
33	2.50E-14	701,000,000	4.73E+00
34	9.93E-15	701,000,000	4.73E+00

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APPENDIX E.1: COST FUNCTIONS

The cost of applying emission controls to benzene waste operations was estimated by developing cost functions for each type of emission control. For each cost function, the quantity of waste to be treated or otherwise controlled was used as the independent variable. Total nationwide costs of emission controls were estimated by applying the cost function for each control to the total nationwide waste quantity to which each control is applied. A brief discussion of the basis for each cost function used in this analysis is presented below and the functions are summarized in Table E-1.

Steam Stripping

The costs for steam stripping were taken from Reference 14. The basic design includes a storage tank, feed preheater, steam stripping tray column, primary condenser, overhead collection decanter, flame arrestor, and pumps. The storage tank is sized to provide a retention time of 48 hours. This tank can be used to allow settling of solids or separation of organic and aqueous phases. A total of 1,500 m of connective piping is included to transport various process wastewaters to the centrally located steam stripper. The column height is 18.3 m with a total of 31 sieve trays. The design steam rate is 0.06 kg steam per liter of wastewater. Emphasis was placed on generating a design that would be most cost effective, be within practical design parameters, and would remove virtually 100 percent of the highly volatile compounds. (The controlling compound used for design purposes was benzene.)

The cost estimate used in this analysis is based on a steam stripper that treats about 300 L/min of wastewater (130,000 Mg/yr). The total capital cost was estimated as \$610,000 or \$4.70/Mg of wastewater. The total annual cost of \$230,000 per year yields an annual cost function of \$1.70/Mg of wastewater.¹⁴

Thin-Film Evaporator

Cost estimates for thin-film evaporation (TFE) were taken from the TSDF cost document.¹⁸ The TFE cost in that document is based on a design that includes a waste storage (feed) tank, preheater, three side-entry feed mixers, condenser, condensate storage tank, decanter, and a heated surface area of 10 square meters. The unit is designed to process 17,600 Mg/yr of sludge. The total capital cost was estimated at \$1.2 million (\$68/Mg) with a total annual

TABLE E-1. COST FUNCTIONS USED FOR BENZENE-CONTAINING WASTES (\$1986)

Control	Applied to	Cost functions (\$/Mg)	
		Capital	Annual
Submerged fill	Containers, tank trucks	0.83	0.15
95% control device	Tank vents	4.11	2.57
Steam stripping	Wastewater treatment	4.70	1.70
Thin-film evaporation	Land disposed sludges	68	14.16
Waste incineration	Organic liquids	--	35

cost of \$249,000 (\$14.16/Mg). This estimate has limitations similar to those for steam stripping. For example, economy of scale is not considered in the use of the average cost function, and a specific plant may incur higher or lower costs depending on the quantity of waste and the amount of steam required.

Waste Incineration Costs

Waste incineration costs are also presented in the TSDF cost document for different types of waste streams as follows:¹⁹

<u>Waste type</u>	<u>Cost (\$ Mg)</u>	
	<u>Capital</u>	<u>Annual</u>
Organic sludge/slurry	469	70
Organic solid	284	64
Organic liquid (U009)	440	70

For the purpose of estimating nationwide costs, organic liquids are the major type of waste stream considered for incineration. However, many organic liquids have a recoverable fuel value and might be burned onsite in existing boilers or furnaces. If the waste is shipped to a hazardous waste incinerator, a facility would incur an annual disposal cost for that waste but would not incur the capital cost of constructing an incinerator. A cost of \$35/Mg was used for incineration of organic liquids based on a range of \$0 (burning to recover and use the heating value) to \$70/Mg for disposal in a hazardous waste incinerator as estimated in the TSDF cost document. For a specific facility's waste, the cost of incineration may be higher or lower than the midrange estimate depending on the heating value of the waste and other characteristics, such as water, solids, metals, or chlorine content.

Submerged Fill and Tank Controls

The costs for submerged fill and for tank controls were taken from the TSDF BID.¹⁵ The cost estimates in that document were developed for model units that were derived statistically from data on the types of units found at hazardous waste facilities. The TSDF BID developed cost estimates for a range of model wastes to represent the types of wastes handled at these facilities. The estimated cost for submerged fill for containers and tank trucks is \$0.83/Mg capital cost and \$0.15/Mg for total annual cost.

The TSDF BID evaluated the emission control costs for several types of tanks, including open, covered, and aerated. The level of detail available from the data base for benzene-containing wastes was not sufficient to allow identification of the different tank types; consequently, an overall average cost was used for all tanks. The types of controls used in the cost estimate include covers for open tanks, internal floating roofs for covered tanks, venting to a carbon adsorber, and venting to an existing control device. An average cost was estimated based on the costs given in the TSDF BID for 20,000 gallon tanks that are either open or covered:

Tank Type	Waste quantity (Mg/yr)	Capital cost (\$/Mg)	Annual cost (\$/Mg)
Covered storage	4,000	11.1	5.2
Covered treatment	28,000	0.46	0.24
Open treatment	28,000	0.77	0.27
Average		4.11	1.90

The total annual cost was estimated using the average values given above and a capital recovery factor of 0.163 (10 years at 10 percent interest) as \$2.57/Mg. As illustrated above, costs can vary significantly depending on the type of tank and quantity of waste. For this analysis, sufficient data were not available to differentiate among open, covered, and aerated tanks. For any given facility, the costs for controlling tanks may be higher or lower than that given by the average cost function.