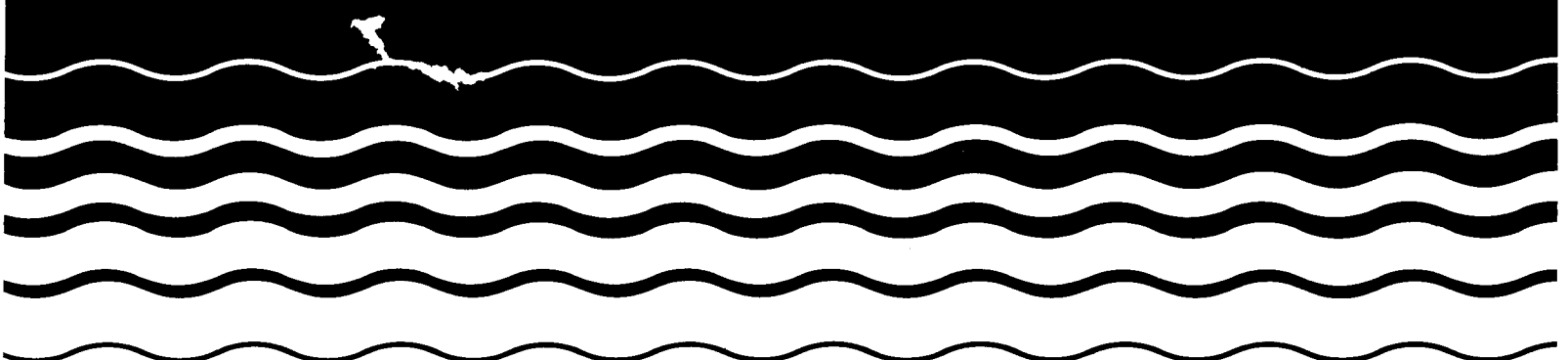
United States
Environmental Protection
Agency

Office Of Water
(WH-552)

EPA 821-R-93-013
September 1993

EPA

Cost-Effectiveness Analysis Of Final Effluent Limitations Guidelines And Standards For The Pesticide Manufacturing Industry



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ACKNOWLEDGEMENTS

The most credit must be given to Dr. Thomas E. Fielding for his knowledge, experience, cooperation, and leadership as project officer, and to the whole pesticide team for their professional manner, conscientious effort, and contributions.

Credit must also be given to Abt Associates for their assistance and support in performing the underlying analysis supporting the conclusions detailed in this report. Their study was performed under Contracts 68-C0-0080, 68-03-3548, and 68-C3-0302. Particular thanks are given to Randi Currier and Robert Sartain.

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SECTION 1: INTRODUCTION

This analysis is submitted in support of the final effluent limitations guidelines and standards for the Pesticide Chemical Manufacturers Industry. The report analyzes the cost-effectiveness of the final rule.[1] The total annualized cost incurred under the rule is compared to the effectiveness of the rule in reducing the discharge of pollutants. The effectiveness measure used is pounds of pollutant removed weighted by an estimate of the relative toxicity of the pollutant. The rationale for this measure, referred to as "pounds-equivalent (PE) removed," is described later in this report.

Section 2 of the report discusses the cost-effectiveness methodology employed including the pollutants included in the analysis and the toxic weighting factors. Section 3 reviews the changes in the cost-effectiveness analysis that have occurred since issuance of the proposed rule. Section 4 presents the results of the final analysis. In Section 5, the final cost-effectiveness values are compared to cost-effectiveness values for other promulgated rules. Seven appendices are also included. Appendix A lists the pesticide active ingredients (PAIs) or classes of PAIs considered for regulation. Appendix B lists the individual PAIs being regulated. Appendix C lists the PAIs or classes of PAIs and priority pollutants included in the cost-effectiveness analysis. Appendix D provides toxic weighting factors for PAIs and priority pollutants. Appendix E lists the removal efficiencies for priority pollutants at publicly-owned treatment works (POTWs). Appendix F provides details regarding pesticide manufacturing facilities that are excluded from the cost-effectiveness analysis. Finally, Appendix G provides a sensitivity analysis of POTW removal efficiencies.

[1]Detailed information on the rule can be found in *Final Development Document for Best Available Technology, Pretreatment Technology, And New Source Performance Technology for the Pesticide Chemical Industry* (hereafter the Technical Development Document).

SECTION 2: METHODOLOGY

Cost-effectiveness calculations are used in the process of setting effluent limitations guidelines and standards to rank the efficiency of regulatory options in removing pollutants. Cost-effectiveness analysis also facilitates the comparison of the efficiency of proposed or promulgated rules to the efficiency of previous rules. Cost-effectiveness is defined as the incremental (to another option or to a benchmark, such as existing treatment) annual cost of a pollution control option in an industry or industry subcategory per incremental pollutant removal (measured in copper-based pounds-equivalent). In other words, the cost-effectiveness value represents the unit cost of removing the next pound-equivalent of a pollutant. While not required by the Clean Water Act, the cost-effectiveness analysis is a useful tool for evaluating regulatory options for the removal of toxic pollutants.[2] It is not intended to analyze the removal of conventional pollutants (oil and grease, biological oxygen demand and total suspended solids), thus the removal of conventional pollutants is not addressed in this report.

A cost-effectiveness calculation is simply a ratio of the annualized cost of a regulatory control option for a group of dischargers to the pollutant loadings removed from surface waters by that option for that particular group of dischargers.[3] Three factors are of particular importance in the cost-effectiveness calculations. First, the analysis is based on removals of "pounds-equivalent" -- a term used to describe a pound of pollutant weighted for its toxicity.[4] Use of pounds-equivalent reflects the fact that some pollutants are more toxic than others and permits removals to be summed across pollutants. Second, where there are a number of control options being evaluated, the analysis is done on an incremental basis -- using the incremental cost and removals of one control option compared to another control option or to existing treatment.[5] Third, cost-effectiveness values are considered high or low only within a given context, such as similar discharge status or compared to effluent limitations guidelines for other industries.

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[2]Cost-effectiveness analysis is applied to Best Available Technology Economically Achievable and Pretreatment Standard for Existing Sources rules which control toxic pollutants.

[3]For control technologies that remove pollutants that would otherwise be volatilized prior to dilution in the receiving stream, the cost-effectiveness analysis includes removals of volatile pollutants as well as removals from the aqueous wastestream.

[4]Copper is used as the standard pollutant for developing toxic weighting factors because it is a toxic metal and is commonly both released and removed from industrial effluent.

[5]Incremental cost-effectiveness can be calculated from current treatment or from another control option.

There are a number of steps in a cost-effectiveness analysis which may be summarized as follows:

- Determine the relevant wastewater pollutants;
- Estimate relative toxic weights of priority and other pollutants;
- Define pollution control approaches;
- Calculate pollutant removals for each control option;
- Determine annualized cost for each control option;
- Calculate cost-effectiveness values (and adjust to 1981 year dollars); and
- Compare cost-effectiveness values.

These steps are discussed below.

1. Pollutant Discharges Considered in a Cost-Effectiveness Analysis

Under the pesticide manufacturer effluent limitations guidelines, 260 pesticide active ingredients (PAIs) or classes of PAIs were considered for regulation. Some of the factors considered in selecting pollutants for regulation include toxicity, treatability, measurability, frequency of occurrence, and amount of pollutant in the wastestream. Of the 260 PAIs or classes of PAIs, 120 individual PAIs were selected for regulation. In addition, 28 priority pollutants were identified for regulation. Not all regulated pollutants, however, are included in the cost-effectiveness analysis since some regulated pollutants may no longer be produced and therefore have no associated compliance costs. Also, measurements of pollutants loadings are not available for some regulated pollutants. There are 75 PAIs or classes of PAIs and 46 priority pollutants included in this cost-effectiveness analysis.[6] Appendix A lists the 260 PAIs or classes of PAIs considered for regulation. Appendix B lists the 120 individual PAIs and 28 priority pollutants selected for regulation. Appendix C lists the 75 PAIs or classes of PAIs and 46 priority pollutants included in the cost-effectiveness analysis.

2. Relative Toxic Weights of Priority and Other Pollutants

Cost-effectiveness analyses account for differences in toxicity among the regulated pollutants by using toxic weighting factors (TWFs). These factors are necessary because different pollutants have different potential effects on human and aquatic life. For example, a pound of nickel (TWF=0.036) in an effluent stream has a significantly lesser potential effect than a pound of cadmium (TWF=5.12). The toxic weighting factors are used to calculate the (copper-based) "pound-equivalent" unit -- a standard measure of toxicity.

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[6]The number of priority pollutants included in the analysis is greater than those regulated because some non-regulated priority pollutants that are present at low levels in the manufacturing processes are controlled to some extent as a result of the technologies used to control for regulated PAIs or priority pollutants. Also, the 75 PAIs or classes of PAIs incorporated in the analysis include nine PAIs that are not part of the 120 regulated PAIs because these nine PAIs are associated with regulated priority pollutants in the wastestream.

In the majority of cases, toxic weighting factors are derived from both chronic freshwater aquatic criteria (or toxic effect levels) and human health criteria (or toxic effect levels) established for the consumption of fish.[7] These factors are then standardized by relating them to copper.[8] The resulting toxic weighting factors for each PAI and priority pollutant are shown in Appendix D. Some examples of the effects of different aquatic and human health criteria on weighting factors are shown in Table 1.

Table 1

Weighting Factors Based on Copper Freshwater Chronic Criteria

Pollutant	Human Health Criteria* (ug/l)	Aquatic Chronic Criteria (ug/l)	Weighting Calculation	Toxic Weighting Factor
Copper**	--	12.0	5.6/12.0	0.467
Hexavalent Chromium	3,400	11.0	5.6/3,400 + 5.6/11	0.511
Nickel	4,600	160.0	5.6/4,600 + 5.6/160	0.036
Cadmium	170	1.1	5.6/170 + 5.6/1.1	5.12
Benzene	12	265.0	5.6/12 + 5.6/265	0.488

Note: Criteria are maximum contamination thresholds. Using the above calculation, the greater the values for the criteria used, the lower the toxic weighting factor. Units for criteria are micrograms of pollutant per liter of water.

* Based on ingestion of 6.5 grams of fish per day.

** While the water quality criterion for copper has been revised (to 12.0 ug/l), the cost-effectiveness analysis uses the old criterion (5.6 ug/l) to facilitate comparisons with cost-effectiveness values for other effluent limitations guidelines. The revised higher criteria for copper results in a toxic weighting factor for copper not equal to 1.0 but equal to 0.467.

As indicated in Table 1, the toxic weighting factor is the sum of two criteria-weighted ratios: the "old" copper criterion divided by the human health criterion for the particular pollutant and the "old" copper criterion divided by the aquatic chronic criterion. For example, using the values reported in Table 1, 10.96 pounds of copper

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[7]A complete discussion of the development of the toxic weighting factors can be found in *Toxic Weighting Factors for Pesticide Active Ingredients and Priority Pollutants*, Final Report, July 13, 1993, located in the Administrative Record.

[8]While the water quality criterion for copper has been revised (to 12.0 ug/l), the cost-effectiveness analysis uses the old criterion (5.6 ug/l) to facilitate comparisons with cost-effectiveness values for other effluent limitations guidelines. The revised higher criteria for copper results in a toxic weighting factor for copper not equal to 1.0 but equal to 0.467.

pose the same toxicity in surface waters as one pound of cadmium since cadmium has a toxic weight 10.96 times (5.12/0.467=10.96) as large as the toxic weight of copper. The cost-effectiveness analysis examines only the toxicity of pollutants, and is not a full risk-based analysis that would consider pollutant fate, transport and exposure pathways.

3. Pollution Control Options

Limitations under the final rule are based on the use of biological treatment, hydrolysis, activated carbon, chemical oxidation, resin adsorption, solvent extraction, incineration and/or recycle/reuse to control the discharge of PAIs in wastewater. Further information on the control options can be found in the Technical Development Document. The cost-effectiveness analysis was conducted separately for direct and indirect dischargers. Costs for direct dischargers were calculated for compliance with a Best Available Technology (BAT) regulation; costs for indirect dischargers were calculated for compliance with Pretreatment Standard for Existing Sources (PSES).[9] Each discharge category was further divided into two subcategories: organic pesticide chemicals manufacturing (Subcategory A) and metallo-organic pesticide chemicals manufacturing (Subcategory B). No new limitations are being promulgated for Subcategory B.[10]

4. Calculation of Pollutant Removals

The reductions in pollutant loading to the receiving water body have been calculated for the final rule. These at-stream pollutant removals are equal to end-of-pipe pollutant removals for direct dischargers. For indirect dischargers, however, at-stream and end-of-pipe removals may differ due to treatment at the POTW. Calculation of removals for direct and indirect dischargers is discussed below.

Direct dischargers

Current and post-treatment end-of-pipe annual pollutant loadings for each facility have been estimated. Removals are calculated as the difference between current and post-treatment discharges. Removals are then weighted using the copper-based toxic weighting factors and reported in pounds-equivalent. Total removals associated with Subcategory A are calculated by summing removals over all direct discharging facilities. There are

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[9]A discussion of the economic impacts of the regulation can be found in *Economic Impact Analysis of Final Effluent Limitations Guidelines and Standards for the Pesticide Manufacturing Industry* (hereafter the Final EIA).

[10]For an analysis of the cost-effectiveness of regulations upon Subcategory B chemicals, see the cost-effectiveness analysis presented at proposal.

no removals for Subcategory B since direct discharge of such chemicals is already limited to zero by BPT regulations.

Indirect Dischargers

Calculation of pollutant removals for indirect dischargers is similar to calculation of removals for direct dischargers. However, calculation of priority pollutant removals includes the possible effects of treatment at the POTW. For some pollutants, part of the end-of-pipe pollutant loadings for indirect dischargers may be removed by the POTW. Therefore, at-stream loadings from an indirect discharging facility may be less than end-of-pipe loadings. As a result, the at-stream removal of pollutants attributable to PSES regulations are considered to be less than end-of-pipe removal of pollutants. The cost-effectiveness analysis takes into account POTW removals for priority pollutants and attributes to the regulation only removals that occur at-stream.[11]

For example, if a facility is discharging 100 pounds of cadmium in its effluent stream to a POTW and the POTW has a removal efficiency for cadmium of 38 percent, then the amount of cadmium discharged to surface waters is only 62 pounds. If the regulation results in an end-of-pipe reduction of cadmium in the effluent stream to 50 pounds, then the amount discharged to surface waters is calculated as 50 pounds multiplied by the POTW removal efficiency factor (1-.38 or .62), i.e., 31 pounds (50 pounds x .62). Cost-effectiveness calculations reflect the fact that the actual reduction of pollutant discharge to surface waters is not 50 pounds (the change in the amount discharged to the POTW), but 31 pounds (= 62 - 31) (the change in the amount actually discharged to surface waters). The analysis does not consider any pollutants that remain in the waste sludge of the POTW. The POTW removals factors used in the analysis are shown in Appendix E.

5. Annualized Costs for the Final Rule

Full details of the methods by which the costs of complying with the final rule were estimated can be found in Chapter 8, Engineering Costs and Non-Water Quality Aspects, of the Technical Development Document. A brief summary of the compliance costs is provided below.

Three categories of compliance costs associated with pesticide manufacturing were evaluated: capital costs, land costs, and operating and maintenance costs (including sludge disposal and self-monitoring costs). While the capital and land costs are one-time "lump sum" costs, the operating and maintenance costs are evaluated on an

[11]POTW removals for PAIs are not accounted for in the main analysis due to the lack of definitive treatment data. Appendix G, however, provides a sensitivity analysis of POTW removal efficiencies for PAIs.

annual basis. The capital and land are conservatively assumed to have a productive life of ten years. Using the weighted average cost of capital, the capital and land costs are amortized to account for the cost of financing the investment (through equity and debt) over the ten-year period.[12] Total annualized costs are equal to annualized capital and land costs plus operating and maintenance costs. For facilities that both manufacture and formulate/package pesticides, the compliance costs apply only to the manufacturing operations of the facility. All of the compliance cost estimates are based on the assumption that, whenever possible, facilities will build on existing treatment. The reported costs are the full costs of compliance, some of which will be borne by the government in the form of decreased tax receipts. The analysis therefore overstates the burden of the regulations on industry.

6. Calculation of Cost-Effectiveness Values

Facilities are included in the analysis only if they have pollutant removal values associated with compliance costs. As a result, under the final rule, certain facilities with compliance costs are not included in the cost-effectiveness analysis. (See Appendix F for details of excluded facilities).

Cost-effectiveness values are calculated separately for direct and indirect dischargers for Subcategory A. For any given subset of dischargers and subcategories subject to proposed regulatory controls, the cost-effectiveness value for the rule is calculated as the ratio of incremental annual cost of the rule to the incremental pounds-equivalent removed by the rule. The incremental effectiveness may be viewed both in comparison to the baseline scenario and to another regulatory option. Cost-effectiveness values are reported in units of dollars per pound-equivalent of pollutant removed. For the purpose of comparing cost-effectiveness values of the final rule to those of other promulgated rules, compliance costs used in the cost-effectiveness analysis are adjusted to 1981 dollars using Engineering News Record's Construction Cost Index (CCI). This adjustment factor is calculated as follows:

$$\text{Adjustment factor} = \frac{\text{1981 CCI}}{\text{1986 CCI}} = \frac{3535}{4295} = 0.823$$

[12]For details on the weighted average cost of capital see the discussion of the facility closure analysis in the final EIA.

The equation used to calculate cost-effectiveness is:

$$CE_k = \frac{ATC_k - ATC_{k-1}}{PE_k - PE_{k-1}}$$

where:

CE_k = cost-effectiveness of Option $_k$;

ATC_k = total annualized treatment cost under Option $_k$; and

PE_k = pounds-equivalent removed by Option $_k$.

The numerator of the equation, ATC_k minus ATC_{k-1} , is simply the incremental annualized treatment cost in going from Option k-1 to Option k. The denominator is similarly the incremental removals achieved in going from Option k-1 to Option k. Thus, cost-effectiveness measures the incremental unit cost of pollutant removal of Option k (in pounds-equivalent).

Cost-effectiveness values of options may be compared incrementally to current treatment by using the same formula and setting the benchmark costs (ATC_{k-1}) equal to zero. The benchmark pollutant loadings (PE_{k-1}) are then set equal to the current at-stream loading.

7. Comparisons of Cost-Effectiveness Values

Two types of comparisons are typically done using cost-effectiveness values. Compliance costs (y axis) and pollutant removals (x axis) may be plotted to derive a marginal cost curve to determine which options offer the most cost-effective regulatory control. Alternatively, the cost-effectiveness of regulatory options incremental to the baseline scenario can be used to assess the cost-effectiveness of controls relative to previously promulgated effluent limitations guidelines for other industries. Because only the final rule is analyzed in this cost-effectiveness report, graphical representation of the incremental effectiveness of control options is unnecessary. As at proposal, the comparison of incremental cost-effectiveness values for the rule is from treatment that is already in place.[13]

[13]The final rule is less expensive and more cost-effective than the option that was not selected.

SECTION 3: CHANGES SINCE PROPOSAL

The April 10, 1992 notice of proposed rule-making included an analysis of the cost-effectiveness of the effluent limitations and guidelines for the pesticide manufacturing industry. The results of the analysis as presented at proposal are briefly reviewed below. Changes that have occurred in the analysis since proposal are then presented.

Table 2 summarizes the findings of the cost-effectiveness analysis of the Treated Discharge Option at proposal. As the table indicates, the BAT cost-effectiveness was about $10 per pound-equivalent. The PSES cost-effectiveness was $1.00 per pound-equivalent.[14]

Table 2
Cost-Effectiveness Values for Subcategory A
BAT (Direct Dischargers) and PSES (Indirect Dischargers) at Proposal

Option Name (number of facilities)	Compliance Costs ($ 1981)	Total Removals (lbs) *	Total Removals (copper lb-eq.) *	Cost-Effectiveness Value ($/lb-eq.)
BAT (24)	$11,907,740	5,994,072	1,198,882	$9.93
PSES Subcategory A (22)	$4,825,615	109,177	4,832,553	$1.00

* Total removals include water removals as well as air removals from volatile organic compounds that are captured and otherwise would have been released.

For the final rule, facilities that have actually closed since 1986 are not included in the economic impact analysis or in the cost-effectiveness analysis.[15] In addition, in response to public comments on the proposed rule, EPA has re-estimated compliance costs for several facilities.[16] Finally, between the proposed rule and the final rule, the toxic weighting factor (TWF) for one pollutant included in the analysis, organo-tin, decreased from 17,829

[14]The reported costs are the full costs of compliance, some of which will be borne by the government in the form of decreased tax receipts. The analysis therefore overstates the burden of the regulations on industry.

[15]For a complete discussion of the number of facilities subject to compliance costs and the revisions to those costs, refer to the final EIA.

[16]Estimated investment costs at one facility have increased from $1.6 million to $16 million since proposal (see Chapter 4 of the Final EIA). This change in estimated compliance costs resulted from public comments by the facility. EPA maintains that the actual compliance costs for this facility would be lower than the estimates used in the final analysis. However, analysis using these higher cost estimates ensures that EPA does not underestimate the burden of compliance at this facility.

rule, the toxic weighting factor (TWF) for one pollutant included in the analysis, organo-tin, decreased from 17,829 to 357. The smaller TWF for organo-tin reflects the updating of the human toxicity value used in the calculation of the TWF. A revised bioconcentration factor for organo-tin resulted in the change in the human toxicity value. The change in the TWF for organo-tin did not have any material effect on the overall cost-effectiveness of the final rule.

Under the final rule, there are 55 facilities that are expected to incur compliance costs: 33 direct dischargers and 23 indirect dischargers.[17] As under the proposed rule, however, several facilities are excluded from the cost-effectiveness analysis because pollutant removal data are not available; see Appendix F for more details. Twenty-five direct dischargers and 19 indirect dischargers are included in the analysis.

Total annualized costs for compliance with BAT are estimated at $14.8 million (1981 dollars). Under PSES, the estimated total annualized compliance costs are now $4.17 million (1981 dollars) for Subcategory A PAIs.[18]

[17] One of these facilities is both a direct and indirect discharger.

[18]Cost-effectiveness values are reported in 1981 dollars for comparisons with previous rules.

SECTION 4: RESULTS

The cost-effectiveness analysis is based on the Agency's estimates of the full cost of compliance and wastewater pollution removals associated with a Best Available Technology (BAT) option for direct dischargers and a Pretreatment Standard for Existing Sources (PSES) option for indirect dischargers.

The cost-effectiveness analysis includes 25 direct discharging facilities and 19 indirect discharging facilities. These numbers are smaller than the total number of facilities expected to incur costs under the regulation (33 directs and 23 indirects) because, as discussed in Appendix F, facilities are excluded from the cost-effectiveness analysis if pollutant loading data were not available.[19] Some facilities expected to incur only monitoring costs required by permitting authorities are included in the analysis even though monitoring is not required by the rule.

4.1 Best Available Technology

A combination of treatment technologies is employed to treat a facility's wastewater. Some pollutant discharge to surface water remains under the rule. Table 3 presents the cost-effectiveness data and results for direct dischargers. As shown in the table, the cost-effectiveness for the final rule is $14.41 per pound-equivalent removed (Subcategory A).[20]

4.2 Pretreatment Standard for Existing Sources

A combination of technologies is employed to treat a facility's wastewater prior to discharge to a sewer or to a publicly-owned treatment works (POTW). The cost-effectiveness analysis of indirect dischargers measures removals as the change in at-stream pollutant loadings (after the wastestream has passed through the POTW).

Table 3 presents the cost-effectiveness data and results for indirect dischargers for the final rule. As shown in the table, the cost-effectiveness for the rule is $17.50 per pound-equivalent removed for Subcategory A.

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[19]One facility has both direct and indirect discharges.

[20]For comparative purposes, cost-effectiveness values are reported in 1981 year dollars.

Table 3
Final Cost-Effectiveness Values for Subcategory A
BAT (Direct Dischargers) and PSES (Indirect Dischargers)

Name (number of facilities)	Compliance Costs ($ 1981)	Total Removals (lbs)	Total Removals (copper lb-eq.)	Cost-Effectiveness Value ($/lb-eq.)
BAT (25)	$14,830,661	5,970,948	1,029,032	$14.41
PSES (19)	$4,165,939	27,905	238,076	$17.50

* Total removals include water removals as well as air removals from volatile organic compounds that are captured and otherwise would have been released.

SECTION 5: COMPARISON OF COST-EFFECTIVENESS VALUES WITH PROMULGATED RULES

Table 4 presents the cost-effectiveness values for effluent limitations guidelines and standards issued for direct dischargers in other industries. The BAT rule for pesticide manufacturers is relatively cost-effective when compared to the cost-effectiveness values for other effluent limitations guidelines.

Table 5 presents the cost-effectiveness values for effluent limitations guidelines issued for indirect dischargers in other industries. As with BAT, the PSES rule for pesticide manufacturers is cost-effective when compared to the cost-effectiveness values for other effluent limitations guidelines.

Table 4
Industry Comparison of Cost-effectiveness for
Direct Dischargers
(Toxic and Nonconventional Pollutants Only)
Copper Based Weights
(1981 Dollars)*

Industry	Pounds Equivalent Currently Discharged (000's)	Pounds Equivalent Remaining at Selected Option (000's)	Cost Effectiveness Selected Option(s) ($/lb-eq. removed)
Aluminum Forming	1,340	90	121
Battery Manufacturing	4,126	5	2
Canmaking	12	0.2	10
Coal Mining	BAT=BPT	BAT=BPT	BAT=BPT
Coil Coating	2,289	9	49
Copper Forming	70	8	27
Electronics I	9	3	404
Electronics II	NA	NA	NA
Foundries	2,308	39	84
Inorganic Chemicals I	32,503	1,290	++
Inorganic Chemicals II	605	27	6
Iron & Steel	40,746	1,040	2
Leather Tanning	259	112	BAT=BPT
Metal Finishing	3,305	3,268	12
Nonferrous Metals Forming	34	2	69
Nonferrous Metals Mfg I	6,653	313	4
Nonferrous Metals Mfg II	1,004	12	6
OCPSF**	54,225	9,735	5
Pharmaceuticals	208	4	1
Plastics Molding & Forming	44	41	BAT=BPT
Porcelain Enameling	1,086	63	6
Petroleum Refining	BAT=BPT	BAT=BPT	BAT=BPT
Pulp & Paper***	1,330	748	18
Textile Mills	BAT=BPT	BAT=BPT	BAT=BPT

* Although toxic weighting factors for priority pollutants varied across these rules, this table reflects the cost-effectiveness at the time of regulation.

** Reflects costs and removals of both air and water pollutants.

*** PCB control for Deink subcategory only.

++ Less than a dollar.

Table 5
Industry Comparison of Cost-effectiveness for
Indirect Dischargers
(Toxic and Nonconventional Pollutants Only)
Copper Based Weights
(1981 Dollars)*

Industry	Pounds Equivalent Currently Discharged (To Surface Waters) (000's)	Pounds Equivalent Remaining at Selected Option (To Surface Waters) (000's)	Cost Effectiveness Selected Option(s) Beyond BPT** ($/lb-eq. removed)
Aluminum Forming	1,602	18	155
Battery Manufacturing	1,152	5	15
Can Making	252	5	38
Coal Mining***	N/A	N/A	N/A**
Coil Coating	2,503	10	10
Copper Forming	34	4	10
Electronics I	75	35	14
Electronics II	260	24	14
Foundries	2,136	18	116
Inorganic Chemicals I	3,971	3,004	9
Inorganic Chemicals II	4,760	6	++
Iron & Steel	5,599	1,404	6
Leather Tanning	16,830	1,899	111
Metal Finishing	11,680	755	10
Nonferrous Metals Forming	189	5	90
Nonferrous Metals Mfg I	3,187	19	15
Nonferrous Metals Mfg II	38	0.41	12
OCPSF	5,210	72	34
Pharmaceuticals	340	63	1
Plast. Molding & Forming	N/A	N/A	N/A
Porcelain Enameling	1,565	96	14
Pulp & Paper	N/A	N/A	N/A

* Although toxic weighting factors for priority pollutants varied across these rules, this table reflects the cost-effectiveness at the time of regulation.

** N/A: Pretreatment Standards not promulgated, or no incremental costs will be incurred.

*** Reflects costs and removals of both air and water pollutants.

**** Industry has no known or expected indirect dischargers.

++ Less than a dollar.

References

1980 Ambient Water Quality Criteria Document (EPA-440/5-80 Series)

Quality Criteria for Water, EPA 440/9-76-023, EPA 1976 (the Red Book)

Engineering News Record History: First Quarterly Cost Report. Construction Costs Tracked for U.S. Engineering News Record, March 25, 1992.

U.S. EPA Toxic Weighting Factors for Pesticide Active Ingredients and Priority Pollutants, Draft Final Report, March 18, 1992.

APPENDIX A: PESTICIDE ACTIVE INGREDIENTS CONSIDERED FOR REGULATION

This appendix provides the pesticide active ingredients considered for regulation.

Pesticide Number	Pesticide Name	CAS Number
1	Dicofol [1,1-Bis(chlorophenyl)-2,2,2-trichloroethanol]	00115-32-2
2	Maleic Hydrazide	00123-33-1
3	EDB [1,2-Ethylene dibromide]	00106-93-4
4	Vancide TH [1,3,5-Triethylhexahydro-s-triazine]	07779-27-3
5	Dichloropropene	00542-75-6
7	Dowicil 75 [1-(3-Chloroallyl)-3,5,7-triaza-1-azoniaadamantanechloride]	04080-31-3
8	Triadimefon	43121-43-3
9	Hexachlorophene (nabac)	00070-30-4
10	Tetrachlorophene	01940-43-8
11	Dichlorophene	00097-23-4
12	Dichlorvos	00062-73-7
13	Landrin-2 [2,3,5-trimethylphenylmethylcarbamate]	02686-99-9
14	Fenac [2,3,6-Trichlorophenylacetic acid] or any salt or ester	00085-34-7
15	2,4,5-T [2,4,5-Trichlorophenoxyacetic acid] or any salt or ester	00093-76-5
16	2,4-D [2,4-Dichlorophenoxyacetic acid] or any salt or ester	00094-75-7
17	2,4-DB [2,4-Dichlorophenoxybutyric acid] or any salt or ester	00094-82-6
18	Anilazine [2,4-Dichloro-6-(o-chloroanilino)-s-triazine]	00101-05-3
19	Dinocap	39300-45-3
20	Dichloran (2,6-dichloro-4-nitroaniline)	00099-30-9
21	Busan 90 [2-Bromo-4-hydroxyacetophenone]	02491-38-5
22	Mevinphos	07786-34-7
23	Sulfallate [2-chloroallyldiethyldithiocarbamate]	00095-06-7
24	Chlorfenvinphos	00470-90-6
25	Cyanazine	21725-46-2
26	Propachlor	01918-16-7
27	MCPA [2-Methyl-4-chlorophenoxyacetic acid] or any salt or ester	00094-74-6
28	Octhilinone	26530-20-1
29	Pindone	00083-26-1
30	Dichlorprop [2-(2,4-Dichlorophenoxy) propionic acid] or any salt or ester	00120-36-5
31	MCPP [2-(2-Methyl-4-chlorophenoxy)propionic acid] or any salt or ester	00093-65-2
32	Thiabendazole	00148-79-8
33	Belclene 310 [2-(methylthio)-4-(ethylamino)-6-(1,2-dimethylamino)-s-triazine]	22936-75-0
34	Cloprop [2-(m-Chlorophenoxy)propionic acid] or any salt or ester	00101-10-0
35	TCMTB [2-(Thiocyanomethylthio)benzothiazole]	21564-17-0
36	HAE [2-((Hydroxymethyl)amino) ethanol	34375-28-5
37	Chlorophacinone	03691-35-8
38	Landrin-1 [3,4,5-trimethylphenylmethylcarbamate]	02686-99-9

Pesticide Number	Pesticide Name	CAS Number
39	Pronamide	23950-58-5
40	Methiocarb	02032-65-7
41	Propanil	00709-98-8
42	Polyphase antimildew [3-Iodo-2-propynyl butylcarbamate]	55406-53-6
43	3-(a-Acetonylfurfuryl)-4-hydroxycoumarin [Coumafuryl] or any salt or ester	00117-52-2
44	DNOC (4,6-dinitro-o-cresol)	00534-52-1
45	Metribuzin	21087-64-9
46	CPA (4-chlorophenoxyacetic acid) or any salt or ester	00122-88-3
47	MCPB [4-(2-Methyl-4-chlorophenoxy)butyric acid] or any salt or ester	00094-81-5
48	Aminocarb [4-(dimethylamino)-m-tolylmethylcarbamate]	02032-59-9
49	Etridiazole	02593-15-9
50	Ethoxyquin	00091-53-2
51	Quinoliol sulfate (8-Quinoliol sulfate)	00134-31-6
52	Acephate	30560-19-1
53	Acifluorfen or any salt or ester	50594-66-6
54	Alachlor	15972-60-8
55	Aldicarb	00116-06-3
56	Hyamine 3500 [Alkyl* dimethyl benzyl ammonium chloride * (50% C14, 40% C12, 10% C16)]	68424-85-1
57	Allethrin (all isomers and allethrin coil)	00584-79-2
58	Ametryn	00834-12-8
59	Amitraz	33089-61-1
60	Atrazine	01912-24-9
61	Bendiocarb	22781-23-3
62	Benomyl and Carbendazim	17804-35-2
63	Benzene Hexachloride	00608-73-1
64	Benzyl benzoate	00120-51-4
65	Lethane 384 [Beta-Thiocyanoethyl esters of mixed fatty acids containing from 10-18 carbons]	00301-11-1
66	Bifenox	42576-02-3
68	Bromacil or any salt or ester	00314-40-9
69	Bromoxynil or any salt or ester	01689-84-5
70	Butachlor	23184-66-9
71	Giv-gard [β-Bromo-β-nitrostyrene]	07166-19-0
73	Captafol	02425-06-1
74	Captan	00133-06-2
75	Carbaryl [Sevin]	00063-25-2
76	Carbofuran	01563-66-2
77	Carbosulfan	55285-14-8
78	Chloramben or any salt or ester	00133-90-4

Pesticide Number	Pesticide Name	CAS Number
79	Chlordane	00057-74-9
80	Chloroneb	02675-77-6
81	Chloropicrin	00076-06-2
82	Chlorothalonil	01897-45-6
83	Chloroxuron	01982-47-4
84	Stirofos	00961-11-5
85	Chlorpyrifos methyl	05598-13-0
86	Chlorpyrifos	02921-88-2
87	Mancozeb	08018-01-7
90	Fenvalerate	51630-58-1
91	Cycloheximide	00066-81-9
92	Dalapon (2,2-dichloropropionic acid) or any salt or ester	00075-99-0
93	Dienochlor	02227-17-0
94	Demeton [O,O-Diethyl O-(and S-) (2-ethylthio)ethyl) phosphorothioate]	08065-48-3
95	Desmedipham	13684-56-5
96	Diammonium ethylenebisdithiocarbamate	03566-10-7
97	DBCP [Dibromo-3-chloropropane]	00096-12-8
98	Dicamba [3,6-Dichloro-o-anisic acid] or any salt or ester	01918-00-9
99	Dichlone (Phygon)	00117-80-6
100	Thiophanate ethyl	23564-06-9
101	Perthane [Diethyl diphenyl dichloroethane and related compounds]	00072-56-0
102	EXD [Diethyl dithiobis (thionoformate)]	00502-55-6
103	Diazinon	00333-41-5
104	Diflubenzuron	35367-38-5
105	Benzethonium chloride	00121-54-0
106	Dimethoate	00060-51-5
107	Parathion methyl	00298-00-0
108	Dicrotophos	00141-66-2
109	Crotoxyphos	07700-17-6
110	DCPA [Dimethyl 2,3,5,6-tetrachloroterephthalate]	01861-32-1
111	Trichlorofon	00052-68-6
112	Dinoseb	00088-85-7
113	Dioxathion	00078-34-2
114	Diphacinone	00082-66-6
115	Diphenamid	00957-51-7
116	Diphenylamine	00122-39-4
117	MGK 326 [Dipropyl isocinchomeronate]	00113-48-4
118	Nabonate [Disodium cyanodithioimidocarbonate]	00138-93-2
119	Diuron	00330-54-1

Pesticide Number	Pesticide Name	CAS Number
120	Metasol DGH [Dodecylguanidine hydrochloride]	13590-97-1
121	Dodine (dodecylquanidine acetate)	02439-10-3
122	Endosulfan [Hexachlorohexahydromethano-2,4,3-benzodioxathiepin-3-oxide]	00115-29-7
123	Endothall or any salt or ester	00145-73-3
124	Endrin	00072-20-8
125	Ethalfluralin	55283-68-6
126	Ethion	00563-12-2
127	Ethoprop	13194-48-4
128	Fenamiphos	22224-92-6
129	Chlorobenzilate	00510-15-6
130	Butylate	02008-41-5
131	Famphur	00052-85-7
132	Fenarimol	60168-88-9
133	Fenthion	00055-38-9
134	Ferbam	14484-64-1
135	Fluometuron	02164-17-2
136	Fluoroacetamide	00640-19-7
137	Folpet	00133-07-3
138	Glyphosate [N-(Phosphonomethyl) glycine] or any salt or ester	01071-83-6
139	Glyphosine	02439-99-8
140	Heptachlor	00076-44-8
141	Cycloprate	54460-46-7
142	Hexazinone	51235-04-2
143	Isofenphos	25311-71-1
144	Isopropalin	33820-53-0
145	Propham	00122-42-9
146	Karbutilate	04849-32-5
147	Lindane	00058-89-9
148	Linuron	00330-55-2
149	Malachite green [Ammonium(4-(p-(dimethylamino)-alpha-phenylbenzylidine)-2,5-cyclohexadien-1-ylidene)-dimethyl chloride]	00569-64-2
150	Malathion	00121-75-5
151	Maneb	12427-38-2
152	Manganous dimethyldithiocarbamate	15339-36-3
153	Mefluidide [N-(2,4-dimethyl-5-(((trifluoromethyl) sulfonyl)-amino) phenyl acetamide] or any salt or ester	53780-34-0
154	Methamidophos	10265-92-6
155	Methidathion	00950-37-8
156	Methomyl	16752-77-5
157	Methoprene	40596-69-8

Pesticide Number	Pesticide Name	CAS Number
158	Methoxychlor	00072-43-5
159	Methylbenzethonium chloride	15716-02-6
160	Methylbromide	00074-83-9
162	Hyamine 2389 [Methyldodecylbenzyl trimethyl ammonium chloride 80% and methyldodecylxylylene bis (trimethylammoniumchloride) 20%]	01399-80-0
163	Methylenebisthiocyanate	06317-18-6
164	Quinmethionate	02439-01-2
165	Metolachlor	51218-45-2
166	Mexacarbate	00315-18-4
167	Metiram	09006-42-2
168	Monuron TCA	00140-41-0
169	Monuron	00150-68-5
170	Napropamide	15299-99-7
171	Deet	00134-62-3
172	Nabam	00142-59-6
173	Naled	00300-76-5
174	Norea	18530-56-8
175	Norflurazon	27314-13-2
176	Naptalam [N-1-Naphthylphthalamic acid] or any salt or ester	00132-66-1
177	MGK 264 [N-2-Ethylhexyl bicycloheptene dicarboximide]	00136-45-8
178	Benfluralin	01861-40-1
179	Sulfotepp	03689-24-5
180	Aspon	03244-90-4
181	Coumaphos	00056-72-4
182	Fensulfothion	00115-90-2
183	Disulfoton	00298-04-4
184	Fenitrothion	00122-14-5
185	Phosmet	00732-11-6
186	Azinphos Methyl	00086-50-0
187	Oxydemeton methyl	00301-12-2
192	Organo-tin pesticides	-----
194	Oryzalin	19044-88-3
195	Oxamyl	23135-22-0
196	Oxyfluorfen	42874-03-3
197	Bolstar [Sulprofos]	35400-43-2
198	Sulprofos Oxon	38527-90-1
199	Santox (O-Ethyl O-(p-nitrophenyl) phenylphosphonothioate	02104-64-5
200	Fonofos	00944-22-9
201	Propoxur (o-Isopropylphenylmethylcarbamate)	00114-26-1
203	Parathion	00056-38-2

Pesticide Number	Pesticide Name	CAS Number
204	Pendimethalin	40487-42-1
205	Pentachloronitrobenzene	00082-68-8
206	Pentachlorophenol or any salt or ester	00087-86-5
207	Perfluidone	37924-13-3
208	Permethrin	52645-53-1
209	Phenmedipham	13684-63-4
210	Phenothiazine	00092-84-2
211	Phenylphenol	00090-43-7
212	Phorate	00298-02-2
213	Phosalone	02310-17-0
214	Phosphamidon	13171-21-6
215	Picloram or any salt or ester	01918-02-1
216	Piperonyl butoxide	00051-03-6
217	PBED (Busan 77) [Poly (oxyethylene (dimethylimino) ethylene (dimethylimino) ethylene dichloride]	31512-74-0
218	Busan 85 [Potassium dimethyldithiocarbamate]	00128-03-0
219	Busan 40 [Potassium N-hydroxymethyl-N-methyldithiocarbamate]	51026-28-9
220	KN Methyl [Potassium N-methyldithiocarbamate]	00137-41-7
221	Metasol J26 [Potassium N-(alpha-(nitroethyl) benzyl)-ethylenediamine]	53404-62-9
222	Profenofos	41198-08-7
223	Prometon	01610-18-0
224	Prometryn	07287-19-6
225	Propargite	02312-35-8
226	Propazine	00139-40-2
227	Propionic acid	00079-09-4
228	Propamocarb and Propamocarb HCL	24579-73-5
229	Pyrethrin coils	-----
230	Pyrethrin I	00121-21-1
231	Pyrethrin II	00121-29-9
232	Pyrethrum (other than pyrethrins)	08003-34-7
233	Resmethrin	10453-86-8
234	Ronnel	00299-84-3
235	Rotenone	00083-79-4
236	DEF [S,S,S-Tributyl phosphorotrithioate]	00078-48-8
237	Siduron	01982-49-6
238	Silvex [2-(2,4,5-Trichlorophenoxypropionic acid)] or any salt or ester	00093-72-1
239	Simazine	00122-34-9
240	Bentazon	25057-89-0
241	Carbam-S [Sodium dimethyldithiocarbanate]	00128-04-1

Pesticide Number	Pesticide Name	CAS Number
242	Sodium monofluoroacetate	00062-74-8
243	Vapam [Sodium methyldithiocarbamate]	00137-42-8
244	Sulfoxide	00120-62-7
245	Cycloate	01134-23-2
246	EPTC [S-Ethyl dipropylthiocarbamate]	00759-94-4
247	Molinate	02212-67-1
248	Pebulate	01114-71-2
249	Vernolate	01929-77-7
250	HPTMS [S-(2-Hydroxypropyl) thiomethanesulfonate]	29803-57-4
251	Bensulide	00741-58-2
252	Tebuthiuron	34014-18-1
253	Temephos	03383-96-8
254	Terbacil	05902-51-2
255	Terbufos	13071-79-9
256	Terbuthylazine	05915-41-3
257	Terbutryn	00886-50-0
258	Tetrachlorophenol or any salt or ester	25167-83-3
259	Dazomet	00533-74-4
260	Thiophanate methyl	23564-05-8
251	Thiram	00137-26-8
262	Toxaphene	08001-35-2
263	Merphos [Tributyl phosphorotrithioate]	00150-50-5
264	Trifluralin	01582-09-8
265	Warfarin [3-(a-Acetonylbenzyl)-4-hydroxycoumarin] or any salt or ester	00081-81-2
266	Zinc MBT [Zinc 2-mercaptobenzothiazolate]	00155-04-4
267	Zineb	12122-67-7
268	Ziram	00137-30-4
269	S-(2,3,3-trichloroallyl) diisopropylthiocarbamate	02303-17-5
270	Phenothrin	26002-80-2
271	Tetramethrin	07696-12-0
272	Chloropropham	00101-21-3

APPENDIX B: PESTICIDE ACTIVE INGREDIENTS SELECTED FOR REGULATION

This appendix provides the pesticide active ingredients selected for regulation.

Pollutant	Pollutant Name	CAS Number
008	Triadimefon	43121-43-3
012	Dichlorvos	00062-73-7
016	2,4-D	00094-75-7
016	2,4-D, 2-butoxylethyl ester	00094-75-7
016	2,4-D, 2-ethylhexyl ester	00094-75-7
016	2,4-D, 2-octyl ester	00094-75-7
016	2,4-D, butyl ester	00094-75-7
016	2,4-D, diethanolamine salt	00094-75-7
016	2,4-D, dimethylamine salt	00094-75-7
016	2,4-D, isopropyl ester	00094-75-7
016	2,4-D, isopropylamine salt	00094-75-7
016	2,4-D, triethanolamine salt	00094-75-7
016	2,4-D, triisopropanolamine salt	00094-75-7
017	2,4-DB, 2-ethylhexyl ester	00094-82-6
017	2,4-DB, dimethylamine salt	00094-82-6
017	2,4-DB, isopropyl ester	00094-82-6
022	Mevinphos/Phosdrin	07786-34-7
025	Cyanazine	21725-46-2
026	Propachlor	01918-16-7
027	MCPA, 2-ethylhexyl ester	00094-74-6
027	MCPA, dimethylamine salt	00094-74-6
027	MCPA, isooctyl ester	00094-74-6
027	MCPA, sodium salt	00094-74-6
030	Dichlorprop, 2-ethylhexyl ester	00120-36-5
030	Dichlorprop, dimethylamine salt	00120-36-5
030	Dichlorprop, isooctyl ester	00120-36-5
031	MCPP/Mecoprop, 2-ethylhexyl ester	00093-65-2
031	MCPP/Mecoprop, diethanolamine salt	00093-65-2
031	MCPP/Mecoprop, dimethylamine salt	00093-65-2
031	MCPP/Mecoprop, isooctyl ester	00093-65-2
035	TCMTB	21564-17-0
039	Pronamide	23950-58-5
041	Propanil	00709-98-8
045	Metribuzin	21087-64-9
052	Acephate	30560-19-1
053	Acifluorfen/Blazer	50594-66-6
054	Alachlor/Lasso	15972-60-8

Pollutant	Pollutant Name	CAS Number
055	Aldicarb/Temik	00116-06-3
058	Ametryn	00834-12-8
060	Atrazine	01912-24-9
062	Benomyl/Carbendazim	17804-35-2
068	Bromacil	00314-40-9
068	Bromacil, Lithium Salt	00314-40-9
069	Bromoxynil	01689-84-5
069	Bromoxynil Octanoate	01689-84-5
070	Butachlor	23184-66-9
073	Captafol	02425-06-1
075	Carbaryl/Sevin	00063-25-2
076	Carbofuran/Furadan	01563-14-8
080	Chloroneb	02675-77-6
082	Chlorothalonil	01897-45-6
084	Stirofos	00961-11-5
086	Chlorpyrifos	02921-88-2
090	Fenvalerate	51630-58-1
103	Diazinon/Spectracide	00333-41-5
107	Parathion Methyl	00298-00-0
110	DCPA (Dimethyltetrachloro-terephthalate)	01861-32-1
112	Dinoseb	00088-85-7
113	Dioxathion	00078-34-2
118	Nabonate	00138-93-2
119	Diuron	00330-54-1
123	Endothall, N,N-dimethylcocoamine salt	00145-73-3
123	Endothall, Potassium salt	00145-73-3
123	Endothall, Sodium salt	00145-73-3
124	Endrin	00072-20-8
125	Ethalfluralin	55283-68-6
126	Ethion/Bladan	00563-12-2
132	Fenarimol/Rubigan	60168-88-9
133	Fenthion/Baytex	00055-38-9
140	Heptachlor	00076-44-8
144	Isopropalin	33820-53-0
148	Linuron	00330-55-2
150	Malathion	00121-75-5
154	Methamidophos	10265-92-6
156	Methomyl/Lannate	16752-77-5
158	Methoxychlor	00072-43-5
172	Nabam	00142-59-6

Pollutant	Pollutant Name	CAS Number
172	Nabam	00142-59-6
173	Naled	00300-76-5
175	Norflurazon	27314-13-2
178	Benfluralin	01861-40-1
182	Fensulfothion	00115-90-2
183	Disulfoton	00298-04-4
185	Phosmet (rextalize only)	00732-11-6
186	Azinphos Methyl	00086-50-0
192	Organotin:Neostannox [2-(methyl-2-phenylolpropyl)distannoxane]	----
192	Organotin:Tributyltin benzoate	----
192	Organotin:Tributyltin fluoride	----
192	Organotin:Tributyltin monopropyleneglycolmaleate	----
192	Organotin:Tributyltin neodecanoate	----
192	Organotin:Tributyltin oxide	----
192	Organotin:Trihexatin [Tricyclohexyl tin hydroxide]	----
192	Organotin:Triphenyltin hydroxide	----
197	Bolstar/Sulprofos	35400-43-2
203	Parathion Ethyl	00056-38-2
204	Pendimethalin/Prowl	40487-42-1
205	PCNB	00082-68-8
208	Permethrin/Ambush/Pounce	52645-53-1
212	Phorate	00298-02-2
218	Busan 85	00128-03-0
219	Busan 40	51026-28-9
220	KN Methyl	00137-41-7
223	Prometon	01610-18-0
224	Prometyrn/Caparol	07287-19-6
226	Propazine	00139-40-2
230	Pyrethrin I	00121-21-1
231	Pyrethrin II	00121-29-9
236	DEF	00078-48-8
239	Simazine	00122-34-9
241	Carbam-S	25057-89-0
243	Vapam/Metham sodium	00137-42-8
252	Tebuthiuron	34014-18-1
254	Terbacil	05902-51-2
255	Terbufos/Counter	13071-79-9

Pollutant	Pollutant Name	CAS Number
256	Terbuthylazine	05915-41-3
257	Terbutryn	00886-50-0
259	Dazomet	00533-74-4
262	Toxaphene	08001-35-2
263	Merphos	00150-50-5
264	Trifluralin/Treflan	01582-09-8
268	Ziram/Cymate	00137-30-4

APPENDIX C: PESTICIDE ACTIVE INGREDIENTS AND PRIORITY POLLUTANTS INCLUDED IN THE COST-EFFECTIVENESS ANALYSIS

This appendix lists the pesticide active ingredients and priority pollutants included in the cost-effectiveness analysis.

Pesticide Active Ingredient (PAI) or Priority Pollutant (PP)	Pollutant Number	Pollutant Name	CAS Number
PAI	5	Dichloropropene, 1,3	542756
PAI	8	Triadimefon	43121432
PAI	12	Dichlorvos	62737
PAI	16	2,4-D	94757
PAI	17	2,4-DB	94826
PAI	22	Mevinphos\Phosdrin	7786347
PAI	25	Cyanazine	21725462
PAI	26	Propachlor	1918167
PAI	27	MCPA	94746
PAI	30	Dichlorprop	120365
PAI	35	Busan 72/TCMTB	21564170
PAI	39	Pronamide	23950584
PAI	41	Propanil	709988
PAI	45	Metribuzin	21087648
PAI	52	Acephate	30560192
PAI	53	Acifluorfen\Blazer	50594664
PAI	54	Alachlor\Lasso	15972608
PAI	55	Aldicarb\Temik	116063
PAI	58	Ametryn	834128
PAI	60	Atrazine	1912249
PAI	62	Benomyl	17804352
PAI	68	Bromacil	314409
PAI	69	Bromoxynil	1689845
PAI	70	Butachlor	23184668
PAI	75	Carbaryl\Sevin	63252
PAI	76	Carbofuran\Furadan	1563662
PAI	80	Chloroneb	2675776
PAI	81	Chloropicrin	76062
PAI	82	Chlorothalonil	1897456
PAI	86	Chlorpyrifos\Dursban	2921882
PAI	103	Diazinon\Spectracide	333415
PAI	110	DCPA\Dacthal	1861321
PAI	113	Dioxathion	78342
PAI	118	Nabonate	138932
PAI	125	Ethalfluralin	55283688
PAI	126	Ethion\Bladan	563122

Pesticide Active Ingredient (PAI) or Priority Pollutant (PP)	Pollutant Number	Pollutant Name	CAS Number
PAI	132	Fenarimol\Rubigan	60168888
PAI	133	Fenthion\Baytex	55389
PAI	135	Fluometuron	2164172
PAI	138	Glyphosate\Roundup	1071836
PAI	140	Heptachlor	76448
PAI	144	Isopropalin	33820528
PAI	154	Methamidophos	10265926
PAI	156	Methomyl\Lannate	16752775
PAI	158	Methoxychlor	72435
PAI	171	Deet	134623
PAI	172	Nabam	142596
PAI	178	Benfluralin	1861401
PAI	182	Fensulfothion	115902
PAI	183	Disulfoton	298044
PAI	192	Tributyltin	----
PAI	196	Oxyfluorofen	42874032
PAI	197	Sulprofos	35400432
PAI	204	Pendimethalin	40487420
PAI	208	Permethrin	52645532
PAI	211	Phenylphenol, o-	90437
PAI	212	Phorate	298022
PAI	216	Piperonyl butoxide	51036
PAI	218	Busan 85	128030
PAI	219	Busan 40	51026288
PAI	220	KN Metyl	81990336
PAI	223	Prometon\Pramitol	1610180
PAI	224	Prometyrn\Caparol	7287196
PAI	226	Propazine	139402
PAI	236	DEF	78488
PAI	239	Simazine	122349
PAI	241	Carbam-S	128041
PAI	243	Metham sodium\Vapam	137428
PAI	252	Tebuthiuron	34014180
PAI	254	Terbacil	5902512
PAI	256	Terbuthylazine	5915413
PAI	257	Terbutryn	886500
PAI	259	Busamid\Dazomet\Mylo	533744

Pesticide Active Ingredient (PAI) or Priority Pollutant (PP)	Pollutant Number	Pollutant Name	CAS Number
PAI	264	Trifluralin\Treflan	1582098
PAI	275	Pyrethrins	8003347
PP	1	Acenaphthene	83329
PP	4	Benzene	71432
PP	6	Methane, Tetrachloro	56235
PP	7	Benzene, Chloro-	108907
PP	10	Ethane, 1,2-Dichloro	107062
PP	11	Ethane, 1,1,1-Trichloro	71556
PP	12	Ethane, Hexachloro-	67721
PP	13	Ethane, 1,1-Dichloro	75343
PP	15	Ethane, 1,1,2,2-Tetrachloro	79345
PP	16	Ethane, Chloro-	75003
PP	21	Phenol, 2,4,6-Trichloro	88062
PP	23	Methane, Trichloro-	67663
PP	24	Phenol, 2-Chloro-	95578
PP	25	Benzene, 1,2-Dichloro	95501
PP	27	Benzene, 1,4-Dichloro	106467
PP	29	Ethene, 1,1-Dichloro	75354
PP	30	Ethene, Trans-1,2-Dichloro	156605
PP	31	Phenol, 2,4-Dichloro	120832
PP	32	Propane, 1,2-Dichloro	78875
PP	38	Benzene, Ethyl-	100414
PP	39	Fluoranthene	206440
PP	44	Methane, Dichloro-	75092
PP	45	Methane, Chloro-	74873
PP	46	Methane, Bromo-	74839
PP	47	Methane, Tribromo-	75252
PP	48	Methane, Bromodichloro-	75274
PP	51	Methane, Dibromochloro-	124481
PP	53	Cyclopentadiene, Hex	87683
PP	55	Naphthalene	91203
PP	59	Phenol, 2,4-Dinitro-	51285
PP	65	Phenol	108952
PP	66	Phthalate, Bis-(2-ethylhexyl)-	117817
PP	78	Anthracene	120127
PP	80	Fluorene	86737
PP	81	Phenanthrene	85018

Pesticide Active Ingredient (PAI) or Priority Pollutant (PP)	Pollutant Number	Pollutant Name	CAS Number
PP	84	Pyrene	129000
PP	85	Ethene, Tetrachloro-	127184
PP	86	Toluene	108883
PP	87	Ethene, Trichloro-	79016
PP	115	Arsenic	7440382
PP	119	Chromium	7440473
PP	120	Copper (Total)	7440508
PP	121	Cyanides	57125
PP	122	Lead (Total)	7439921
PP	124	Nickel (Total)	7440020
PP	128	Zinc	7440666

APPENDIX D: TOXIC WEIGHTING FACTORS FOR PESTICIDE ACTIVE INGREDIENTS AND PRIORITY POLLUTANTS

This appendix provides the toxic weighting factors (TWFs) used in the analysis. Toxic weighting factors for pesticide active ingredients are listed in Table D-1, and TWFs for priority pollutants are provided in Table D-2.

TABLE D.1. TOXIC WEIGHTING FACTORS FOR PESTICIDE ACTIVE INGREDIENTS (PAIs)
(CARCINOGENIC HUMAN HEALTH VALUES BASED ON A 10−5 RISK)

EAD PAI No.	CAS No.	Pollutant Name	Aquatic Life Chronic Value (ug/l)	Human Health Ingesting Organisms Only Value (ug/l)	TOXIC WEIGHTING FACTORS (TWFs) Chronic	Human	Total	
A082	1897456	Chlorothalonil	0.076	850	73.68	0.0066	73.69	
A083	1982474	Chloroxuron	4.3		1.30	–	1.30	
A272	101213	Chlorpropham	324	100,000	0.017	5.60E−05	0.017	
A085	5598130	Chlorpyrifos methyl	1	98	5.60	0.057	5.7	
A086	2921882	Chlorpyrifos \ Dursban	0.041	11.8	137	0.475	137	
A089	14951918	Copper EDTA	12		0.467	–	0.467	(a)
A043	117522	Coumafuryl	0.34	25	16.5	0.224	16.7	(c)
A181	56724	Coumaphos	0.001		5,600	–	5,600	
A109	7700176	Crotoxyphos \ Ciodrin	0.55		10.2	–	10.2	
A025	21725462	Cyanazine	100	2,900	0.056	0.0019	0.058	
A245	1134232	Cycloate	45		0.124	–	0.124	
A091	66819	Cycloheximide	70		0.080	–	0.080	
A141	54460467	Cycloprate \ Zardex	0.432		13.0	–	13.0	
A106	60515	Cygon \ Dimethoate	2.2	27	2.55	0.207	2.75	
A092	75990	Dalapon	550	103,000	0.010	5.44E−05	0.010	
A017	94826	DB, 2,4− salts and esters	20	740	0.280	0.0076	0.288	
A110	1861321	DCPA \ Dacthal	62	11,200	0.090	0.0005	0.091	
A171	134623	Deet	3,750		0.0015	–	0.0015	
A236	78488	DEF	0.27	0.1	20.7	56.0	76.7	
A094	8065483	Demeton \ Systox	0.1	0.95	56.0	5.89	61.9	
A187	301122	Demeton−O−methyl	0.4	16,000	14.0	0.0004	14.0	
A095	13684565	Desmedipham \ Betanex	6		0.933	–	0.933	
A103	333415	Diazinon \ Spectracide	0.009	630	622	0.0089	622	
A097	96128	Dibromo−3−chloropropane, 1,2−	810		0.0069	–	0.0069	
A098	1918009	Dicamba	195	23,100	0.029	0.0002	0.029	
A099	117806	Dichlone \ Phygon	0.14		40.0	–	40.0	
A011	97234	Dichlorophen	36		0.156	–	0.156	
A016	94757	Dichlorophenoxyacetic acid, 2,4−	80	1,960	0.0700	0.0029	0.073	
A005	542756	Dichloropropene, 1,3−	4.5	87 *	1.24	0.064	1.31	
A030	120365	Dichlorprop	2,340		0.0024	–	0.0024	
A012	62737	Dichlorvos	0.001	12	5,600	0.467	5,600	
A020	99309	Dicloran \ Botran	147	7,300	0.038	0.0008	0.039	
A001	115322	Dicofol \ Kelthane	0.53	0.0098	10.6	571.429	582.0	
A108	141662	Dicrotophos \ Bidrin	21.5	1,080	0.26	0.01	0.27	
A093	2227170	Dienochlor \ Pentac	0.002		3,294	–	3,294	
A104	35367385	Diflubenzuron	0.16	940	35.0	0.0060	35.0	
A044	534521	Dinitro−o−cresol, 4,6−	3.3	765	1.70	0.0073	1.70	
A019	39300453	Dinocap \ Karathane	0.15		37.3	–	37.3	
A112	88857	Dinoseb \ DNBP	0.32	30	17.5	0.187	17.7	
A113	78342	Dioxathion	0.09	150	62.2	0.037	62.3	
A114	82666	Diphacinone	105		0.053	–	0.053	
A115	957517	Diphenamid	1,600	108,000	0.0035	5.19E−05	0.0036	
A116	122394	Diphenylamine	378	1,000	0.015	0.0056	0.020	
A183	298044	Disulfoton	0.05	0.9	112	6.22	118	
A119	330541	Diuron \ DCMU	1.6	150	3.50	0.037	3.54	
A121	2439103	Dodecylguanidine monoacetate	100	740	0.056	0.0076	0.064	
A007	4080313	Dowicil 75	420		0.013	–	0.013	
A122	115297	Endosulfan mixed isomers	0.056	2	100	2.800	103	
A123	145733	Endothall	7	431,000	0.800	1.30E−05	0.800	
A124	72208	Endrin	0.0023	0.81	2,435	6.91	2,442	
A199	2104645	EPN \ Santox	0.0056	0.009	1,000	622	1,622	
A246	759944	EPTC	575	12,600	0.0097	0.0004	0.010	
A125	55283686	Ethalfluralin	0.08		70.0	–	70.0	

TABLE D.1. TOXIC WEIGHTING FACTORS FOR PESTICIDE ACTIVE INGREDIENTS (PAIs) (CARCINOGENIC HUMAN HEALTH VALUES BASED ON A 10−5 RISK)

EAD PAI No.	CAS No.	Pollutant Name	Aquatic Life Chronic Value (ug/l)	Human Health Ingesting Organisms Only Value (ug/l)	TOXIC WEIGHTING FACTORS (TWFs) Chronic	Human	Total	
A126	563122	Ethion \ Bladan	0.02	3.6	280	1.556	282	
A127	13194484	Ethoprophos	11.5	15	0.487	0.4	0.860	
A050	91532	Ethoxyquin	212		0.026	–	0.026	
A003	106934	Ethylene dibromide	608	0.13	0.0092	43.1	43.1	
A049	2593159	Etridiazole	12.1		0.463	–	0.463	
A102	502556	EXD			–	–	ND	
A131	52857	Famphur \ Famophos	48.5		0.12	–	0.12	
A014	85347	Fenac \ Chlorfenac	55		0.102	–	0.102	
A128	22224926	Fenamiphos	5.5	180	1.02	0.031	1.05	
A132	60168889	Fenarimol \ Rubigan	9.1		0.615	–	0.615	
A184	122145	Fenitrothion	0.5	330	11	0.017	11	
A182	115902	Fensulfothion \ Desanit	0.5	81	11.2	0.069	11.3	
A133	55389	Fenthion \ Baytex	0.006	4.7	933	1.19	935	
A090	51630581	Fenvalerate \ Pydrin	0.036	680	156	0.0082	156	
A134	14484641	Ferbam	4.5	830,000	1.24	6.75E−06	1.24	
A135	2164172	Fluometuron	30	3,400	0.187	0.0016	0.188	
A136	640197	Fluoroacetamide, 2−	2,000		0.0028	–	0.0028	
A137	133073	Folpet	0.39	50	14.4	0.11	14.5	
A200	944229	Fonofos	0.07	144	80.0	0.039	80.0	
A071	7166190	Giv−gard	0.2		28.0	–	28.0	
A138	1071836	Glyphosate \ Roundup	65	34,700	0.086	0.0002	0.086	
A139	1333240	Glyphosine			–	–	ND	
A036	34375285	HAE	4.27E+07		1.31E−07	–	1.31E−07	
A140	76448	Heptachlor	0.0038	0.0021	1,474	2,667	4,140	
A009	70304	Hexachlorophene	1.5	0.009	3.73	622	626	
A142	51235042	Hexazinone	5,000	3,540,000	0.0011	1.58E−06	0.0011	
A250	29803574	HPTMS	486		0.012	–	0.012	
A162	1399800	Hyamine 2389	60		0.093	–	0.093	
A056	68424851	Hyamine 3500	60		0.093	–	0.093	(d)
A072	75605	Hydroxydimethylarsine oxide		65	–	0.086	0.086	
A143	25311711	Isofenphos	400	72	0.014	0.078	0.092	
A144	33820530	Isopropalin	1	273	5.60	0.021	5.6	
A146	4849325	Karbutilate	3,750		0.0015	–	0.0015	
A220	137417	KN Methyl	1.4		4.00	–	4.00	(b)
A038	2686999	Landrin I	50		0.112	–	0.112	
A013	2655154	Landrin II	50		0.112	–	0.112	
A065	112561	Lethane 384	160		0.04	–	0.04	
A148	330552	Linuron	90	300	0.062	0.019	0.081	
A149	569642	Malachite green	0.305		18.4	–	18.4	
A150	121755	Malathion	0.100	2,700	56	0.0021	56	
A002	123331	Maleic hydrazide	6,250	54,000,000	0.0009	1.04E−07	0.0009	
A087	8018017	Mancozeb	23	89,700	0.243	6.24E−05	0.244	
A151	12427382	Maneb \ Vancide	17	54,000,000	0.329	1.04E−07	0.329	
A027	94746	MCPA	60	380	0.093	0.015	0.108	
A047	94815	MCPB	3.5	1,770	1.60	0.0032	1.60	
A031	93652	MCPP \ Mecoprop	445	8,970	0.013	0.0006	0.013	
A153	53780340	Mefluidide	5,000		0.0011	–	0.0011	
A263	150505	Merphos \ Folex	13	0.22	0.431	25.5	25.9	
A120	13590971	Metasol DGH	100	740	0.056	0.0076	0.064	(e)
A221	53404629	Metasol J26	60		0.093	–	0.093	(d)
A243	137428	Metham sodium \ Vapam	1.4		4.00	–	4.00	
A154	10265926	Methamidophos	2,300	5,980	0.0024	0.0009	0.0034	
A155	950378	Methiadathion \ Supracide	0.11	234	50.9	0.024	50.9	

TABLE D.1. TOXIC WEIGHTING FACTORS FOR PESTICIDE ACTIVE INGREDIENTS (PAIs)
(CARCINOGENIC HUMAN HEALTH VALUES BASED ON A 10−5 RISK)

EAD PAI No.	CAS No.	Pollutant Name	Aquatic Life Chronic Value (ug/l)	Human Health Ingesting Organisms Only Value (ug/l)	TOXIC WEIGHTING FACTORS (TWFs) Chronic	Human	Total	
A040	2032657	Methiocarb	0.25	120	22.4	0.0467	22.4	
A156	16752775	Methomyl \ Lannate	0.05	269,000	112	2.08E−05	112	
A157	40596698	Methoprene	15.5	1,300	0.361	0.0043	0.366	
A158	72435	Methoxychlor	0.03	6.5	187	0.862	188	
A159	15716026	Methyl benzethonium chloride	14		0.40	–	0.40	(f)
A161	124583	Methylarsonic acid	40,500		0.0001	–	0.0001	
A167	9006422	Metiram	64		0.088	–	0.088	
A165	51218452	Metolachlor	100	23,400	0.056	0.0002	0.06	
A045	21087649	Metribuzin	2,100	135,000	0.0027	4.15E−05	0.0027	
A022	7786347	Mevinphos \ Phosdrin	0.002	212,000	2,800	2.64E−05	2,800	
A166	315184	Mexacarbate \ Mexcarbole \ Zectran	0.5		11.2	–	11.2	
A177	113484	MGK 264	130		0.043	–	0.043	
A117	136458	MGK 326	666		0.0084	–	0.0084	
A247	2212671	Molinate	10.5	360	0.533	0.016	0.549	
A169	150685	Monuron	4,455		0.0013	–	0.0013	
A168	140410	Monuron TCA	5,000		0.0011	–	0.0011	
A172	142596	Nabam	9.8		0.571	–	0.571	
A118	138932	Nabonate	1.4		4.00	–	4.0	(b)
A163	6317186	Nalco D−2303	3.5		1.60	–	1.60	
A173	300765	Naled \ Dibrom	0.004	3,100	1,400	0.0018	1,400	
A170	15299997	Napropamide	400	21,500	0.014	0.0003	0.014	
A176	132661	Naptalam	3,800		0.0015	–	0.0015	
A152	15339363	Niacide	4.5	820,000	1.24	6.83E−06	1.24	(g)
A174	18530568	Norea \ Noruron	70		0.080	–	0.080	
A175	27314132	Norflurazon	10,000		0.0006	–	0.0006	
A028	26530201	Octhilinone			–	–	ND	
A273		Organo−antimony compounds	30	4,300	0.187	0.0013	0.188	(h)
A189		Organo−cadmium compounds	1.1	170	5.09	0.0329	5.12	(h)
A190		Organo−copper compounds	12		0.467	–	0.467	(h)
A191		Organo−mercury compounds	0.012	0.146	466.7	38	505	(h)
A192		Organo−tin compounds	0.017	0.2	329.4	28	357	(i)
A194	19044883	Oryzalin	9.5	9,100	0.589	0.0006	0.590	
A195	23135220	Oxamyl \ Vydate	24	138,000	0.233	4.06E−05	0.233	
A196	42874033	Oxyfluorofen	124	18	0.045	0.311	0.356	
A203	56382	Parathion ethyl	0.013	125	431	0.045	431	
A107	298000	Parathion methyl	0.007	39	800	0.144	800	
A248	1114712	Pebulate \ Tillam	370		0.015	–	0.015	
A204	40487421	Pendimethalin \ Prowl	4.20	372	1.33	0.015	1.35	
A205	82688	Pentachloronitrobenzene \ Quintozene	6.60	27	0.8	0.211	1.1	
A206	87865	Pentachlorophenol	13	29,000	0.431	0.0002	0.431	
A207	37924132	Perfluidone	15,600		0.0004	–	0.0004	
A208	52645532	Permethrin \ Ambush \ Pounce	0.023	4,300	243.5	0.0013	243.5	
A101	72560	Perthane \ Ethylan	0.04		140	–	140	
A209	13684634	Phenmedipham \ Bentanal	165		0.034	–	0.034	
A210	92842	Phenothiazine	198		0.028	–	0.028	
A006	58366	Phenoxarsine, 10,10'−oxydi−	0.018		311	–	311	
A211	90437	Phenylphenol, o−	59.9	798	0.093	0.0070	0.101	
A212	298022	Phorate \ Famophos \ Thimet	0.006	3.40	933	1.65	935	
A213	2310170	Phosalone \ Azofone	1	76	5.60	0.074	5.7	
A185	732116	Phosmet \ Imidan	0.1	2,600	56.0	0.0022	56.0	
A214	13171216	Phosphamidon \ Dimecron	0.14	2,700	40.0	0.0021	40.0	
A215	1918021	Picloram	1.35	1,400,000	4.15	4.00E−06	4.15	
A029	83261	Pindone	8,630		0.0006	–	0.0006	

TABLE D.1. TOXIC WEIGHTING FACTORS FOR PESTICIDE ACTIVE INGREDIENTS (PAIs)
(CARCINOGENIC HUMAN HEALTH VALUES BASED ON A 10−5 RISK)

EAD PAI No.	CAS No.	Pollutant Name	Aquatic Life Chronic Value (ug/l)	Human Health Ingesting Organisms Only Value (ug/l)	TOXIC WEIGHTING FACTORS (TWFs) Chronic	Human	Total	
A216	51036	Piperonyl butoxide	18.0	120	0.31	0.05	0.36	
A244	120627	Piperonyl sulfoxide	17.7		0.316	–	0.316	
A042	55406536	Polyphase \ Guardsan 388	7,030		0.0008	–	0.0008	
A228	25606411	Previcur N \ Propamocarb HCL	11,750	720,000	0.0005	7.78E−06	0.0005	
A222	41198087	Profenofos \ Curacron	0.008		700	–	700	
A223	1610180	Prometon \ Pramitol	86	150	0.065	0.037	0.102	
A224	7287196	Prometyrn \ Caparol	25	170	0.224	0.033	0.257	
A039	23950585	Pronamide	3,600	8,100,000	0.0016	6.91E−07	0.0016	
A026	1918167	Propachlor	8.5	10,200	0.659	0.0005	0.659	
A041	709988	Propanil	23	485	0.243	0.012	0.255	
A227	79094	Propanoic acid	2,500		0.0022	–	0.0022	
A225	2312358	Propargite/BPPS	1	7,100	5.60	0.0008	5.6	
A226	139402	Propazine	875	1,900	0.0064	0.0029	0.009	
A145	122429	Propham	400	3,300	0.014	0.0017	0.016	
A034	5825876	Propionamide, 2−(m−Chlorophenoxy)	1,050		0.0053	–	0.0053	
A201	114261	Propoxur \ Baygon	0.650	4,600	8.62	0.0012	8.6	
A230	121211	Pyrethrin I	0.014	513	400	0.011	400	
A231	121299	Pyrethrin II	0.014	3,400	400	0.0016	400	
A275	8003347	Pyrethrins	0.014	513	400	0.011	400	
A051	134316	Quinolinol sulfate			–	–	ND	
A164	2439012	Quinomethionate/Oxythioquinox	0.74		7.57	–	7.6	
A233	10453868	Resmethrin	0.0028	436	2,000	0.013	2,000	
A234	299843	Ronnel	1		5.60	–	5.6	
A235	83794	Rotenone \ Mexide	0.026	226	215	0.025	215	
A237	1982496	Siduron	900		0.0062	–	0.0062	
A239	122349	Simazine	10		0.560	–	0.560	
A242	62748	Sodium fluoroacetate	2,000		0.0028	–	0.0028	(j)
A023	95067	Sulfallate \ CDEC	58		0.097	–	0.097	
A198	38527901	Sulprofos oxon	52		0.108	–	0.108	(k)
A270	26002802	Sumithrin \ Phenothrin	0.17		32.9	–	32.9	
A252	34014181	Tebuthiuron	5,600	188,000	0.0010	2.98E−05	0.0010	
A253	3383968	Temephos \ Abate	0.5		11.2	–	11.2	
A254	5902512	Terbacil	3.5	70,000	1.60	8.00E−05	1.60	
A255	13071799	Terbufos \ Counter	0.01	74	560	0.1	560	
A256	5915413	Terbuthylazine	46		0.122	–	0.122	
A257	886500	Terbutryn	8.2	26	0.683	0.215	0.898	
A010	1940438	Tetrachlorophene	18.3		0.306	–	0.306	
A258	58902	Tetrachlorophenol, 2,3,4,6−	10	3,000	0.560	0.0019	0.562	
A084	961115	Tetrachlorvinphos \ Gardona \ Stirofos	4.3	1,200	1.30	0.0047	1.31	
A179	3689245	Tetraethyldithiopyrophosphate	0.08	192	70.0	0.029	70.0	
A271	7696120	Tetramethrin \ Neo−pynamin	0.7		8.00	–	8.0	
A032	148798	Thiabendazole \ Mertect	365	47,500	0.015	0.0001	0.015	
A100	23564069	Thiophanate ethyl	4,950		0.0011	–	0.0011	
A260	23564058	Thiophanate methyl	89	2,800	0.063	0.0020	0.065	
A261	137268	Thiram	1.05	472	5.33	0.012	5.3	
A262	8001352	Toxaphene	0.0002	0.0075	28,000	747	28,747	
A008	43121433	Triadimefon	500	36,400	0.011	0.0002	0.011	
A269	2303175	Tri−allate \ Far−Go	4.9	171	1.14	0.033	1.18	
A111	52686	Trichlorofon \ Dylox	0.265	74,800	21	0.0001	21	
A015	93765	Trichlorophenoxyacetic acid, 2,4,5−	7.5	1,657	0.747	0.0034	0.750	
A238	93721	Trichlorophenoxypropionic acid, 2,4,5−	6	330	0.933	0.017	0.950	
A264	1582098	Trifluralin \ Treflan	1.9	4.1	2.95	1.37	4.3	
A266	155044	Vancide 51Z \ Zetax			–	–	ND	

TABLE D.1. TOXIC WEIGHTING FACTORS FOR PESTICIDE ACTIVE INGREDIENTS (PAIs) (CARCINOGENIC HUMAN HEALTH VALUES BASED ON A 10−5 RISK)

EAD PAI No.	CAS No.	Pollutant Name	Aquatic Life Chronic Value (ug/l)	Human Health Ingesting Organisms Only Value (ug/l)	TOXIC WEIGHTING FACTORS (TWFs) Chronic	Human	Total
A004	7779274	Vancide TH	36.7		0.1526	–	0.153
A249	1929777	Vernolate	11.5	220	0.487	0.025	0.512
A265	81812	Warfarin	0.34	25	16.5	0.224	16.7
A267	12122677	Zineb \ Dithane Z	9.70	3,170	0.5773	1.77E−03	0.579
A268	137304	Ziram \ Cymate	15	2.20E+08	0.373	2.55E−08	0.373

Notes:

* These pollutants are volatile priority pollutants. Therefore, the human health criteria (organisms only) has been replaced with the criteria for (water and organisms). See text for discussion.

a. The TWF for copper is reported for these compounds since the complexes could release copper into the environment********
b. The TWF of metham sodium (vapam) is used for these compounds due to structural similarity.
c. The TWF of warfarin is used for this compound due to structural similarity.
d. The TWF of hyamine 2389 is used for these structurally similar quaternary ammonium compounds.
e. The TWF of dodecylguanidine monoacetate is used for this compound due to structural similarity.
f. The TWF of benzethonium chloride is used for this compound due to structural similarity.
g. The TWF of ferbam is used for this compound due to structural similarity.
h. The TWF for the base metals of these compounds is reported assuming the toxicity is mainly due to the bound metal.
i. The TWF for tributyltin oxide is reported for these compounds since it is the most probable PAI related pollutant in wastewaters.
j. The TWF of 2−fluoroacetamide is used for this compound due to structural similarity.
k. The TWF of bolstar \ sulprofos is used for this compound due to structural similarity.

TABLE D–2. TOXIC WEIGHTING FACTORS FOR PRIORITY POLLUTANTS
(CARCINOGENIC HUMAN HEALTH VALUES BASED ON A 10–5 RISK)

EAD P No.	CAS No.	Pollutant Name	Volatiles	Aquatic Life Chronic Value (ug/l)	Human Health Ingesting Organisms Only Value (ug/l)	Human Health Ingesting Water & Organisms Value (ug/l)	TOXIC WEIGHTING FACTORS Chronic (1)	Human Organisms Only (2)	Human Water & Organisms (3)	Total (1 + 2)	Total (1 + 3) Volatiles
P001	83329	Acenaphthene	V	6.1	2,700	1,200	0.9180	0.0021	0.0047	0.920	0.923
P077	208968	Acenaphthylene	V	17			0.3294			0.329	0.329
P002	107028	Acrolein	V	11.4	780	320	0.4912	0.0072	0.0175	0.498	0.509
P003	107131	Acrylonitrile	V	378	6.7	0.59	0.0148	0.836	9.49	0.851	9.51
P089	309002	Aldrin		0.22	0.23	0.019	25.5	24		50	
P078	120127	Anthracene	V	0.030	4,800	3,300	187	0.001	0.002	187	187
P114	7440360	Antimony		30	4,300	14	0.187	1.3E–03		0.188	
P115	25541544	Arsenic (III)		190	1.4	0.18	0.0295	4.0		4.03	
P115	7440382	Arsenic (total)		190	1.40	0.18	0.0295	4.0	31.111	4.03	
P115	17428410	Arsenic (V)		42	1.4	0.18	0.1333	4.0		4.13	
P116	1332214	Asbestos									
P004	71432	Benzene	V	265	710	12	0.0211	0.0079	0.467	0.029	0.488
P005	92875	Benzidine		125	0.0054	0.0012	0.0448	1,037		1,037	
P072	56553	Benzo(a)anthracene		0.1	15.6	1.4	56.0	0.359		56.4	
P073	50328	Benzo(a)pyrene		0.050	0.311	0.028	112	18.0		130	
P074	205992	Benzo(b)fluoranthene			2.39	0.215		2.34		2.34	
P079	191242	Benzo(ghi)perylene		12.1	28.3	2.55	0.4628	0.198		0.661	
P075	207089	Benzo(k)fluoranthene	V		2.39	0.215		2.34	26.05	2.34	26.05
P117	7440417	Beryllium		5.3	1.32	0.077	1.06	4.24		5.30	
P102	319846	BHC, alpha–		14	0.130	0.039	0.4	43.1		43.48	
P103	319857	BHC, beta–			0.460	0.14		12.2		12.17	
P105	319868	BHC, delta–									
P104	58899	BHC, gamma– \ Lindane		0.080	0.625	0.186	70.0	8.96		78.96	
	608731	BHC, Technical grade		1	0.46	0.14	5.6	12.17		17.77	
P043	111911	Bis(2–chloroethoxy) methane									
P018	111444	Bis(2–chloroethyl) ether		19,000	14.0	0.31	2.9E–04	0.400		0.400	
P042	108601	Bis(2–chloroisopropyl) ether	V	6,300	4,360	34.7	8.9E–04	0.0013	0.161	0.00217	0.162
P066	117817	Bis(2–ethylhexyl) phthalate		360	59.0	17.6	0.02	0.0949		0.11	
P048	75274	Bromodichloromethane	V	21,600	36	2.5	2.6E–04	0.1556	2.24	0.1558	2.24
P046	74839	Bromomethane	V	550	4,700	57	0.0102	0.0012	0.10	0.011	0.11
P041	101553	Bromophenyl phenyl ether, 4–	V	46			0.1217			0.122	0.122
P067	85687	Butyl benzyl phthalate		220	5,200	3,000	0.0255	0.0011		0.0265	
P118	7440439	Cadmium		1.1	170	30	5.09	0.0329		5.12	
P091	57749	Chlordane		0.0043	0.0059	0.0058	1,302	949		2,251	

TABLE D–2. TOXIC WEIGHTING FACTORS FOR PRIORITY POLLUTANTS
(CARCINOGENIC HUMAN HEALTH VALUES BASED ON A 10–5 RISK)

EAD P No.	CAS No.	Pollutant Name	Volatiles	Aquatic Life Chronic Value (ug/l)	Human Health Ingesting Organisms Only Value (ug/l)	Human Health Ingesting Water & Organisms* Value (ug/l)	TOXIC WEIGHTING FACTORS Chronic (1)	Human Organisms Only (2)	Human Water & Organisms (3)	Total (1 + 2)	Total (1 + 3) Volatiles
P007	108907	Chlorobenzene	V	17	21,000	680	0.33	2.7E–04	0.0082	0.33	0.34
P016	75003	Chloroethane		32,800			1.7E–04			1.71E–04	
P088	75014	Chloroethene	V	17,800	5,250	20	3.1E–04	0.0011	0.28	0.00138	0.280
P019	110758	Chloroethylvinyl ether, 2–		17,500			3.2E–04			0.00032	
P045	74873	Chloromethane	V	27,500	4,700	57	2.0E–04	0.0012	0.10	0.0014	0.10
P020	91587	Chloronaphthalene, 2–		16			0.3500			0.3500	
P024	95578	Chlorophenol, 2–		1,000	400	120	0.0056	0.0140		0.0196	
P040	7005723	Chlorophenylphenyl ether, 4–	V	12.9			0.4341			0.434	0.434
P119	16065831	Chromium (III)		210	670,000	33,000	0.0267	8.4E–06		0.0267	
P119	7440473	Chromium (total)		210	670,000	33,000	0.0267	8.4E–06		0.0267	
P119	18540299	Chromium (VI)		11	3,400	170	0.5091	0.0016		0.5107	
P076	218019	Chrysene	V	10.2	38.4	3.46	0.5490	0.146	1.62	0.695	2.17
P120	7440508	Copper		12			0.4667			0.467	
P121	57125	Cyanide		5.2	215,000	700	1.08	2.6E–05		1.077	
P094	72548	DDD		0.001	8.4E–03	8.3E–03	5,600	667		6,267	
P093	72559	DDE		0.001	5.9E–03	5.9E–03	5,600	949		6,549	
P092	50293	DDT		0.001	5.9E–03	5.9E–03	5,600	949		6,549	
P082	53703	Dibenzo(a,h)anthracene		7.02	0.111	0.01	0.7977	50.5		51.2	
P051	124481	Dibromochloromethane	V	2,035	44	3.8	0.0028	0.1273	1.47	0.1300	1.48
P025	95501	Dichlorobenzene, 1,2–	V	360	17,000	2700	0.0156	0.0003	0.002	0.0159	0.0176
P026	541731	Dichlorobenzene, 1,3–	V	1,510	2,600	400	0.0037	0.0022	0.014	0.00586	0.0177
P027	106467	Dichlorobenzene, 1,4–	V	763	3,900	590	0.0073	0.0014	0.009	0.00878	0.0168
P028	91941	Dichlorobenzidine, 3,3'–		21.8	0.770	0.4	0.2569	7.3		7.5	
P013	75343	Dichloroethane, 1,1–	V	2,750	92,300	3,900	0.0020	6.1E–05	0.0014	0.00210	0.00347
P010	107062	Dichloroethane, 1,2–	V	20,000	990	3.8	2.8E–04	0.0057	1.474	0.00594	1.474
P029	75354	Dichloroethene, 1,1–	V	2,400	32.0	0.57	0.0023	0.175	9.82	0.177	9.8
P030	156605	Dichloroethene, trans–1,2–	V	110,000	135,000	700	5.1E–05	4.1E–05	0.008	9.24E–05	0.0081
P044	75092	Dichloromethane	V	9,650	16,000	47	5.8E–04	0.0004	0.12	0.0009	0.12
P031	120832	Dichlorophenol, 2,4–		70	790	93	0.0800	7.1E–03		0.0871	
P032	78875	Dichloropropane, 1,2–	V	8,100	37,400	483	6.9E–04	1.5E–04	0.012	8.41E–04	0.0123
P033	542756	Dichloropropene, 1,3–	V	4.5	14,100	87	1.24	4.0E–04	0.0644	1.24	1.31
P090	60571	Dieldrin		0.0019	1.4E–03	1.3E–03	2,947	4,000		6,947	
P070	84662	Diethyl phthalate		10,000	118,000	23,000	5.6E–04	4.7E–05		6.07E–04	
P071	131113	Dimethyl phthalate		1,700	2,900,000	313,000	0.0033	1.9E–06		0.00330	

TABLE D–2. TOXIC WEIGHTING FACTORS FOR PRIORITY POLLUTANTS
(CARCINOGENIC HUMAN HEALTH VALUES BASED ON A 10–5 RISK)

EAD P No.	CAS No.	Pollutant Name	Volatiles	Aquatic Life Chronic Value (ug/l)	Human Health Ingesting Organisms Only Value (ug/l)	Human Health Ingesting Water & Organisms Value (ug/l)	TOXIC WEIGHTING FACTORS Chronic (1)	Human Organisms Only (2)	Human Water & Organisms (3)	Total (1 + 2)	Total (1 + 3) Volatiles
P034	105679	Dimethylphenol, 2,4–		1,000	1,400	470	0.0056			0.00560	
P068	84742	Di–n–butyl phthalate		35	12,000	2,700	0.1600	4.7E–04		0.160	
P060	534521	Dinitro–o–cresol, 4,6–	V	3.3	765	13.4	1.70	0.0073	0.418	1.70	2.11
P059	51285	Dinitrophenol, 2,4–		27.5	14,300	70	0.2036	3.9E–04		0.204	
P035	121142	Dinitrotoluene, 2,4–		583	42.0	0.5	0.0096	0.1333		0.1429	
P036	606202	Dinitrotoluene, 2,6–		398			0.0141			0.0141	
P069	117840	Di–n–octyl phthalate		3			1.87			1.87	
P037	122667	Diphenylhydrazine, 1,2–		13.5	5.40	0.41	0.4148	1.04		1.45	
P097	1031078	Endosulfan sulfate		0.056	2	0.93	100	2.8000		103	
P095	959988	Endosulfan, alpha–		0.056	2	0.93	100	2.8000		103	
P096	33213659	Endosulfan, beta–		0.056	2	0.93	100	2.8000		103	
P098	72208	Endrin		0.0023	0.810	0.76	2,435	6.91		2,442	
P099	7421934	Endrin aldehyde		0.0023	0.810	0.76	2,435	6.91		2,442	
P038	100414	Ethylbenzene	V	210	29,000	3,100	0.0267	0.0002	0.002	0.0269	0.0285
P039	206440	Fluoranthene		40	370	300	0.1400	0.015		0.155	
P080	86737	Fluorene	V	17	1500	730	0.3294	0.004	0.008	0.333	0.337
P100	76448	Heptachlor		0.0038	0.0021	0.0021	1,474	2,667		4,140	
P101	1024573	Heptachlor epoxide		0.0038	0.0011	0.0010	1,474	5,091		6,565	
P009	118741	Hexachlorobenzene	V	3.68	0.0074	0.0072	1.5	757	778	758	779
P052	87683	Hexachlorobutadiene	V	9.3	500	4.47	0.6022	0.0112	1.25	0.613	1.85
P053	77474	Hexachlorocyclopentadiene	V	5.2	17,500	242	1.08	3.2E–04	0.023	1.077	1.10
P012	67721	Hexachloroethane	V	540	89.0	20	0.0104	0.0629	0.280	0.0733	0.290
P083	193395	Indeno(1,2,3–cd)pyrene		12.1	28.3	2.55	0.4628	0.198		0.661	
P054	78591	Isophorone		5,850	6,000	84	9.6E–04	9.3E–04		1.89E–03	
P122	7439921	Lead		3.2		50	1.75			1.75	
P123	7439976	Mercury		0.012	0.146	0.144	467	38.4		505	
P055	91203	Naphthalene	V	620	6,501	3,774	0.0090	8.6E–04	0.0015	0.00989	0.0105
P124	7440020	Nickel		160	4,600	610	0.0350	0.0012		0.0362	
P056	98953	Nitrobenzene		460	1,900	17	0.0122	2.9E–03		0.0151	
P057	88755	Nitrophenol, 2–		2,315			0.0024			0.0024	
P058	100027	Nitrophenol, 4–	V	395			0.0142			0.0142	0.0142
P061	62759	Nitrosodimethylamine, N–	V	14,000	80	0.0069	4.0E–04	0.0700	812	0.0704	812
P063	621647	Nitrosodi–n–propylamine, N–			2.44	0.05		2.30		2.30	
P062	86306	Nitrosodiphenylamine, N–	V	1,000	160	50	0.0056	0.0350	0.112	0.0406	0.118

TABLE D–2. TOXIC WEIGHTING FACTORS FOR PRIORITY POLLUTANTS
(CARCINOGENIC HUMAN HEALTH VALUES BASED ON A 10–5 RISK)

EAD P No.	CAS No.	Pollutant Name	Volatiles	Aquatic Life Chronic Value (ug/l)	Human Health Ingesting Organisms Only Value (ug/l)	Human Health Ingesting Water & Organisms Value (ug/l)	TOXIC WEIGHTING FACTORS Chronic (1)	Human Organisms Only (2)	Human Water & Organisms (3)	Total (1 + 2)	Total (1 + 3) Volatiles
P022	59507	Parachlorometacresol		1.5		3,000	3.73			3.73	
P112	12674112	PCB–1016		0.014	4.5E–04	4.4E–04	400	12,444		12,844	
P108	11104282	PCB–1221		0.014	4.5E–04	4.4E–04	400	12,444		12,844	
P109	11141165	PCB–1232		0.014	4.5E–04	4.4E–04	400	12,444		12,844	
P106	53469219	PCB–1242		0.014	4.5E–04	4.4E–04	400	12,444		12,844	
P110	12672296	PCB–1248		0.014	4.5E–04	4.4E–04	400	12,444		12,844	
P107	11097691	PCB–1254		0.014	4.5E–04	4.4E–04	400	12,444		12,844	
P111	11096825	PCB–1260		0.014	4.5E–04	4.4E–04	400	12,444		12,844	
P064	87865	Pentachlorophenol		13	29,000	1,000	0.4308	1.9E–04		0.431	
P081	85018	Phenanthrene	V	6.3	54	42	0.89	0.104	0.133	0.99	1.02
P065	108952	Phenol		750	4,600,000	21,000	0.0075	1.2E–06		0.00747	
P084	129000	Pyrene		10.1	38.4	3.46	0.5545	0.146		0.700	
P125	7782492	Selenium		5	9,000	170	1.12	6.2E–04		1.12	
P126	7440224	Silver		0.12	6	50	46.7	0.933		47.6	
P129	1746016	TCDD, 2,3,7,8–		3.8E–08	1.4E–07	1.3E–07	147,368,421	40,000,000		1.87E+08	
P015	79345	Tetrachloroethane, 1,1,2,2–	V	1,700	107	1.7	0.0033	0.0523	3.29	0.0556	3.30
P085	127184	Tetrachloroethene	V	840	88.5	8	0.0067	0.0633	0.70	0.0699	0.707
P006	56235	Tetrachloromethane	V	1,350	44.0	2.5	0.0041	0.1273	2.24	0.1314	2.24
P127	7440280	Thallium		40	48	13	0.1400	0.117		0.257	
P086	108883	Toluene	V	275	200,000	6,800	0.0204	2.8E–05	8.24E–04	0.0204	0.021
P113	8001352	Toxaphene		0.0002	0.0075	0.0073	28,000	747		28,747	
P047	75252	Tribromomethane	V	1,465	4,200	44	0.0038	0.0013	0.13	0.0052	0.13
P008	120821	Trichlorobenzene, 1,2,4–	V	286	230	183	0.0196	0.0243	0.031	0.0439	0.0501
P011	71556	Trichloroethane, 1,1,1–	V	2,000	1,030,000	18,400	0.0028	5.4E–06	3.04E–04	0.0028	0.0031
P014	79005	Trichloroethane, 1,1,2–	V	1,000	418	6	0.0056	0.0134	0.933	0.0190	0.939
P087	79016	Trichloroethene	V	2,200	923	31	0.0025	0.0061	0.181	0.0086	0.183
P023	67663	Trichloromethane	V	1,240	4,700	57	0.0045	0.0012	0.10	0.0057	0.10
P021	88062	Trichlorophenol, 2,4,6–		3.2	36.0	12	1.75	0.156		1.91	
P128	7440666	Zinc		110			0.0509			0.0509	

Notes: The total number of unique chemicals included is 126 excluding various metal oxidation states and alternative compound forms. The EAD P Number is the Engineering and Analysis Division's identification number for priority pollutants.

08/03/93

APPENDIX E: POTW REMOVAL EFFICIENCIES FOR PRIORITY POLLUTANTS

This appendix provides the POTW removal efficiencies for priority pollutants.

Pollutant Number	CAS Number	Pollutant Name	Removal Efficiency
092	50293	DDT	0.00
091	57749	Chlordane	0.00
104	58899	BHC, gamma- \ Lindane	0.00
090	60571	Dieldrin	0.00
061	62759	Nitrosodimethylamine, N-	0.00
098	72208	Endrin	0.00
094	72548	DDD	0.00
093	72559	DDE	0.00
048	75274	Bromodichloromethane	0.00
100	76448	Heptachlor	0.00
054	78591	Isophorone	0.00
062	86306	Nitrosodiphenylamine, N-	0.00
020	91587	Chloronaphthalene, 2-	0.00
037	122667	Diphenylhydrazine, 1,2-	0.00
102	319846	BHC, alpha-	0.00
105	319868	BHC, delta-	0.00
.	608731	BHC, Technical grade	0.00
063	621647	Nitrosodi-n-propylamine, N-	0.00
095	959988	Endosulfan, alpha-	0.00
101	1024573	Heptachlor epoxide	0.00
097	1031078	Endosulfan sulfate	0.00
116	1332214	Asbestos	0.00
129	1746016	TCDD, 2,3,7,8-	0.00
099	7421934	Endrin aldehyde	0.00
127	7440280	Thallium	0.00
.	7440382	Arsenic (total)	0.00
117	7440417	Beryllium	0.00
.	7440473	Chromium (total)	0.00
113	8001352	Toxaphene	0.00
111	11096825	PCB-1260	0.00
107	11097691	PCB-1254	0.00
108	11104282	PCB-1221	0.00
109	11141165	PCB-1232	0.00
110	12672296	PCB-1248	0.00
112	12674112	PCB-1016	0.00
.	16065831	Chromium (III)	0.00
.	17428410	Arsenic (V)	0.00
096	33213659	Endosulfan, beta-	0.00
106	53469219	PCB-1242	0.00
119	18540299	Chromium (VI)	0.18
057	88755	Nitrophenol, 2-	0.27

Pollutant Number	CAS Number	Pollutant Name	Removal Efficiency
016	75003	Chloroethane	0.28
043	111911	Bis(2-chloroethoxy) methane	0.30
115	25541544	Arsenic (III)	0.39
039	206440	Fluoranthene	0.42
103	319857	BHC, beta-	0.43
064	87865	Pentachlorophenol	0.45
125	7782492	Selenium	0.46
045	74873	Chloromethane	0.48
021	88062	Trichlorophenol, 2,4,6-	0.50
034	105679	Dimethylphenol, 2,4-	0.51
124	7440020	Nickel	0.51
027	106467	Dichlorobenzene, 1,4-	0.52
002	107028	Acrolein	0.53
044	75092	Dichloromethane	0.54
042	108601	Bis(2-chloroisopropyl) ether	0.55
019	110758	Chloroethylvinyl ether, 2-	0.55
035	121142	Dinitrotoluene, 2,4-	0.55
036	606202	Dinitrotoluene, 2,6-	0.55
014	79005	Trichloroethane, 1,1,2-	0.56
070	84662	Diethyl phthalate	0.60
066	117817	Bis(2-ethylhexyl) phthalate	0.60
033	542756	Dichloropropene, 1,3-	0.60
123	7439976	Mercury	0.60
056	98953	Nitrobenzene	0.61
118	7440439	Cadmium	0.61
071	131113	Dimethyl phthalate	0.63
047	75252	Tribromomethane	0.65
114	7440360	Antimony	0.66
121	57125	Cyanide	0.70
013	75343	Dichloroethane, 1,1-	0.70
080	86737	Fluorene	0.70
041	101553	Bromophenyl phenyl ether, 4-	0.70
040	7005723	Chlorophenylphenyl ether, 4-	0.70
030	156605	Dichloroethene, trans-1,2-	0.71
023	67663	Trichloromethane	0.73
029	75354	Dichloroethene, 1,1-	0.75
058	100027	Nitrophenol, 4-	0.75
126	7440224	Silver	0.78
128	7440666	Zinc	0.78
068	84742	Di-n-butyl phthalate	0.79
018	111444	Bis(2-chloroethyl) ether	0.80

Pollutant Number	CAS Number	Pollutant Name	Removal Efficiency
069	117840	Di-n-octyl phthalate	0.83
089	309002	Aldrin	0.83
120	7440508	Copper	0.84
085	127184	Tetrachloroethene	0.85
087	79016	Trichloroethene	0.87
006	56235	Tetrachloromethane	0.88
025	95501	Dichlorobenzene, 1,2-	0.89
010	107062	Dichloroethane, 1,2-	0.89
026	541731	Dichlorobenzene, 1,3-	0.89
059	51285	Dinitrophenol, 2,4-	0.90
011	71556	Trichloroethane, 1,1,1-	0.90
067	85687	Butyl benzyl phthalate	0.90
028	91941	Dichlorobenzidine, 3,3'-	0.90
005	92875	Benzidine	0.90
009	118741	Hexachlorobenzene	0.90
051	124481	Dibromochloromethane	0.90
008	12082	Trichlorobenzene, 1,2,4-	0.91
015	79345	Tetrachloroethane, 1,1,2,2-	0.92
122	7439921	Lead	0.92
088	75014	Chloroethene	0.93
060	534521	Dinitro-o-cresol, 4,6-	0.93
038	100414	Ethylbenzene	0.94
082	53703	Dibenzo(a,h)anthracene	0.95
022	59507	Parachlorometacresol	0.95
012	67721	Hexachloroethane	0.95
004	71432	Benzene	0.95
046	74839	Bromomethane	0.95
053	77474	Hexachlorocyclopentadiene	0.95
081	85018	Phenanthrene	0.95
052	87683	Hexachlorobutadiene	0.95
055	91203	Naphthalene	0.95
024	95578	Chlorophenol, 2-	0.95
003	107131	Acrylonitrile	0.95
065	108952	Phenol	0.95
031	120832	Dichlorophenol, 2,4-	0.95
084	129000	Pyrene	0.95
079	191242	Benzo(ghi)perylene	0.95
083	193395	Indeno(1,2,3-cd)pyrene	0.95
074	205992	Benzo(b)fluoranthene	0.95
075	207089	Benzo(k)fluoranthene	0.95
077	208968	Acenaphthylene	0.95

Pollutant Number	CAS Number	Pollutant Name	Removal Efficiency
086	108883	Toluene	0.96
007	108907	Chlorobenzene	0.96
078	120127	Anthracene	0.96
076	218019	Chrysene	0.97
072	56553	Benzo(a)anthracene	0.98
032	78875	Dichloropropane, 1,2-	0.98
001	83329	Acenaphthene	0.98
073	50328	Benzo(a)pyrene	0.99

APPENDIX F: FACILITIES EXCLUDED FROM THE COST-EFFECTIVENESS ANALYSIS

This appendix provides information on the number of facilities excluded from the cost-effectiveness analysis. To be included in the cost-effectiveness analysis for a regulatory option, a facility must incur compliance costs under that option, and must have an associated removal value under the option. A removal value of zero under an option is a valid possibility. The matching of removal values and costs is done by subcategory at the facility level. Matching at the pollutant level is not possible since removal of priority pollutants cannot be explicitly tied to specific costs. The number of facilities that incur costs but are not included in the analysis is discussed below by discharge type.

1. Number of Facilities Incurring Costs

Under the final rule there are 55 facilities projected to incur costs. These 55 facilities are categorized as 33 direct dischargers (including five zero dischargers that reuse, recycle, deep-well inject or incinerate their wastewater) and 23 indirect dischargers (one facility is a joint discharger with both direct and indirect effluent discharge).

2. Number of Direct Dischargers in Cost-Effectiveness Analysis

The five facilities that are currently zero dischargers are not included in the effluent loadings file and their monitoring compliance costs are therefore not included in the cost-effectiveness analysis. Three additional direct discharging facilities have effluent loadings that could not be accurately measured, and are also omitted from the analysis. Dropping these facilities results in 25 direct discharging facilities included in the cost-effectiveness analysis.

3. Number of Indirect Dischargers in Cost-Effectiveness Analysis

Four indirect discharging facilities have effluent levels that could not be accurately measured. Although wastewater quantities are known (allowing calculation of compliance costs), pollutant concentrations within the wastewater were not measurable. Therefore, there are 19 indirect facilities that have both effluent removal values and compliance costs under the final rule.

APPENDIX G: SENSITIVITY ANALYSIS OF POTW REMOVAL EFFICIENCY

This appendix describes a sensitivity analysis applied to the assumption in the cost-effectiveness analysis that pesticide active ingredients (PAIs) are not removed by POTWs.[21] There is very little empirical data on the PAI removals actually achieved by POTWs. The only data available on POTW removal efficiencies for PAIs are from the Domestic Sewage Study (DSS) (Report to Congress on the Discharge of Hazardous Waste to Publicly Owned Treatment Works, February 1986, EPA/530-SW-86-004). The DSS provides laboratory data under ideal conditions to estimate biotreatment removal efficiencies at POTWs for different organic PAI structural groups. These data, however, are not full-scale/in-use POTW data and are therefore not appropriate for use in the cost-effectiveness analysis.

For the sensitivity analysis it is assumed that POTWs remove 50 percent of the PAIs from the wastestream. Based on this 50 percent removal assumption, under the final rule, Subcategory A removals would be 15,509 pounds, or 119,430 pounds-equivalent, at an annualized cost of $4,165,939 (see Table G.1). Thus, the cost-effectiveness would be $268.62 per pound removed, or $34.88 per pound-equivalent. Even under these assumptions the regulation remains cost-effective.

Table G.1
Cost-Effectiveness Values for PSES Options (Indirect Dischargers)
Assuming 50 percent POTW Removal Efficiency

Name (number of facilities)	Compliance Costs ($ 1981)	Total Removals (lbs)	Total Removals (copper lb-eq.)	Cost-Effectiveness Value ($/lb-eq.)
PSES Subcategory A (19)	$4,165,939	15,509	119,430	$34.88

* Total removals include water removals as well as air removals from volatile organic compounds that are captured and otherwise would have been released.

[21] This discussion applies only to indirect discharging facilities, since effluents from direct dischargers do not enter a POTW.