APPENDIX A

ADDITIONAL DISCUSSION OF ASSUMPTIONS USED OR CONSIDERED FOR USE IN THE COST ANNUALIZATION MODEL

A.1 FINANCIAL ASSUMPTIONS

The cost annualization model incorporates several financial assumptions:

- Depreciation method
- Timing between initial investment and operation
- Depreciable lifetime for equipment
- Tax shields on interest payments
- Discount rates

Each assumption, and the alternatives examined in making the assumption, is discussed in detail below.

A.1.1 Depreciation Method

The Agency examined four alternatives for depreciating capital investments:

- Modified Accelerated Cost Recovery System (MACRS)
- Straight-line depreciation
- Section 169 of the Internal Revenue Code
- Section 179 of the Internal Revenue Code

Modified Accelerated Cost Recovery System (MACRS) applies to assets put into service after December 31, 1986. MACRS involves the ability to write off greater portions of the investment in the early

years. In contrast, the straight-line depreciation writes off a constant amount of the investment each year. MACRS offers companies an advantage over the straight-line method because a company's income can be reduced under MACRS by a greater amount in the early years when the time value of money is greater. Table A-1 illustrates the effects of the difference in timing in writing off a $100,000 capital investment. The absolute amount depreciated over the 16-year period is the same—$100,000 for both depreciation methods. The sum of the tax shields is also the same for both methods—$100,000 x 38.46 percent or $38,460. The difference in timing, however, means that MACRS provides a $1,429 benefit over straight-line depreciation (i.e., the difference between the present values of the tax shields). The benefit of using MACRS is clear; MACRS is the depreciation used in the cost annualization model.

Section 169 of the Internal Revenue Code provides an option to amortize pollution control facilities over a 5-year period.[1] Under this provision, 75 percent of the investment could be rapidly amortized in a 5-year period using a straight line method. The 75 percent figure is based on the ratio of allowable lifetime (15 years) to the estimated usable lifetime (20 years) as specified in the Internal Revenue Code Section 169, Subsection (f). Although the tax provision enables the facility to expense the investment over a shorter time period, the advantage is substantially reduced because only 75 percent of the capital investment can be recovered. Tables A-2 and A-3 illustrate the differences between using MACRS and the Section 169 tax provision using hypothetical costs. The present value of the tax shield from depreciation (Column 4) decreases slightly, from $24,790 (Table A-2) to $23,651 (Table A-3). Because there may be no benefit associated with the provision, and the facilities might not get the required certification to take advantage of it, the provision was not included in the cost annualization model.

The Agency also considered the Internal Revenue Code Section 179 provision to elect to expense up to $17,500 the year the investment is placed into service.[2] The Agency assumes that this provision is applied to other investments for the business entity. Its absence in the cost annualization model may result in a slightly more conservative (i.e., higher) estimate of the after-tax annualized cost for the facility.

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[1] Research Institute of America, Inc., 1995. *The Complete Internal Revenue Code*. New York, NY: Research Institute of America, Inc. January.

[2] This assumes that the investment costs do not exceed $200,000 (*The Complete Internal Revenue Code*, Section 179(b)(2); *ibid.*).

Table A-1

Depreciation Methods
Comparison of Straight Line vs. Modified Accelerated Cost Recovery System (MACRS)

Inputs:		
Capital Cost ($):		$100,000
Discount Rate :		7.0%
Depreciable Lifetime (yrs):		15
Marignal Tax Rates:		
	Federal	34.00%
	State	6.75%
	Overall	38.46%

	Straight-Line			MACRS		
Year	Depreciation Rate	Depreciation For Year	Tax-Shield	Depreciation Rate	Depreciation For Year	Tax-Shield
1	0.000%	$0	$0	0.000%	$0	$0
2	6.670%	$6,670	$2,565	10.000%	$10,000	$3,846
3	6.670%	$6,670	$2,565	9.643%	$9,643	$3,708
4	6.670%	$6,670	$2,565	9.272%	$9,272	$3,566
5	6.670%	$6,670	$2,565	8.886%	$8,886	$3,417
6	6.670%	$6,670	$2,565	5.655%	$5,655	$2,174
7	6.670%	$6,670	$2,565	5.655%	$5,655	$2,175
8	6.660%	$6,660	$2,565	5.655%	$5,655	$2,175
9	6.670%	$6,670	$2,565	5.655%	$5,655	$2,175
10	6.660%	$6,660	$2,565	5.655%	$5,655	$2,175
11	6.670%	$6,670	$2,565	5.655%	$5,655	$2,175
12	6.660%	$6,660	$2,565	5.655%	$5,655	$2,175
13	6.670%	$6,670	$2,565	5.655%	$5,655	$2,175
14	6.660%	$6,660	$2,565	5.655%	$5,655	$2,175
15	6.670%	$6,670	$2,565	5.655%	$5,655	$2,175
16	6.670%	$6,670	$2,565	5.655%	$5,655	$2,175
Sum	100.00%	$100,000	$38,474	100.00%	$100,000	$38,457
Present Value		$60,729	$23,361		$64,466	$24,790
Net Benefit of Using MACRS over Straight-Line Method (Year 1 dollars)						$1,429

Source: See text.

Table A-2

Spreadsheet for Annualizing Costs

INPUTS

Facility Code:	30387
Facility Type:	AC/Direct
Option Number:	BAT/Opt. 1
Initial Capital Cost ($):	$100,000
Annual Operation & Maintenance Cost ($):	$10,000
Equipment Lifetime	15
Real Discount Rate:	7.0%
Marginal Income Tax Rates:	
Federal	34.00%
State	6.75%
Combined	38.46%

Column 1	2	3	4	5	6	7	8
Year	Depreciation Rate	Depreciation For Year	Tax Shield From Depreciation	O&M Cost	O&M Tax Shield	Cash Outflow	Cash Outflow After Tax Shields
1	0.000%	$0	$0	$0	$0	$100,000	$100,000
2	10.000%	$10,000	$3,846	$10,000	$3,846	$10,000	$2,309
3	9.643%	$9,643	$3,708	$10,000	$3,846	$10,000	$2,446
4	9.272%	$9,272	$3,566	$10,000	$3,846	$10,000	$2,589
5	8.886%	$8,886	$3,417	$10,000	$3,846	$10,000	$2,738
6	5.655%	$5,655	$2,174	$10,000	$3,846	$10,000	$3,980
7	5.655%	$5,655	$2,175	$10,000	$3,846	$10,000	$3,980
8	5.655%	$5,655	$2,175	$10,000	$3,846	$10,000	$3,980
9	5.655%	$5,655	$2,175	$10,000	$3,846	$10,000	$3,980
10	5.655%	$5,655	$2,175	$10,000	$3,846	$10,000	$3,980
11	5.655%	$5,655	$2,175	$10,000	$3,846	$10,000	$3,980
12	5.655%	$5,655	$2,175	$10,000	$3,846	$10,000	$3,980
13	5.655%	$5,655	$2,175	$10,000	$3,846	$10,000	$3,980
14	5.655%	$5,655	$2,175	$10,000	$3,846	$10,000	$3,980
15	5.655%	$5,655	$2,175	$10,000	$3,846	$10,000	$3,980
16	5.655%	$5,655	$2,175	$10,000	$3,846	$10,000	$3,980
Sum	100.00%	$100,005	$38,457	$150,000	$57,683	$250,000	$153,861
Present Value		$64,466	$24,790	$91,079	$35,024	$191,079	$131,264

	After Tax Shield	Before Tax Shield
Present Value of Incremental Costs:	$131,264	$191,079
Annualized Cost:	$13,895	$20,227

Notes: This spreadsheet assumes that a modified accelerated cost recovery system (MACRS) is used to depreciate capital expenditures.

Table A-3

Spreadsheet for Annualizing Costs Using Section 169 Provision

INPUTS

Facility Type:	30387
Facility Code:	AC/Direct
Option Number:	BAT/Opt. 1
Initial Capital Cost ($):	$100,000
Annual Operation & Maintenance Cost ($):	$10,000
Equipment Lifetime:	15
Real Discount Rate:	7.0%
Marginal Income Tax Rates:	
Federal	34.00%
State	6.75%
Combined	38.46%

Column 1	2	3	4	5	6	7	8
Year	Depreciation Rate	Depreciation For Year	Tax Shield From Depreciation	O&M Cost	O&M Tax Shield	Cash Outflow	Cash Outflow After Tax Shields
1	0.00%	$0	$0	$0	$0	$100,000	$100,000
2	20.00%	$15,000	$5,768	$10,000	$3,846	$10,000	$386
3	20.00%	$15,000	$5,768	$10,000	$3,846	$10,000	$386
4	20.00%	$15,000	$5,768	$10,000	$3,846	$10,000	$386
5	20.00%	$15,000	$5,768	$10,000	$3,846	$10,000	$386
6	20.00%	$15,000	$5,768	$10,000	$3,846	$10,000	$386
7	0.00%	$0	$0	$10,000	$3,846	$10,000	$6,154
8	0.00%	$0	$0	$10,000	$3,846	$10,000	$6,154
9	0.00%	$0	$0	$10,000	$3,846	$10,000	$6,154
10	0.00%	$0	$0	$10,000	$3,846	$10,000	$6,154
11	0.00%	$0	$0	$10,000	$3,846	$10,000	$6,154
12	0.00%	$0	$0	$10,000	$3,846	$10,000	$6,154
13	0.00%	$0	$0	$10,000	$3,846	$10,000	$6,154
14	0.00%	$0	$0	$10,000	$3,846	$10,000	$6,154
15	0.00%	$0	$0	$10,000	$3,846	$10,000	$6,154
16	0.00%	$0	$0	$10,000	$3,846	$10,000	$6,154
Sum	100.00%	$75,000	$28,840	$150,000	$57,690	$250,000	$163,470
Present Value		$61,503	$23,650	$91,079	$35,029	$191,079	$132,400

	After Tax Shield	Before Tax Shield
Present Value of Incremental Costs:	$132,400	$191,079
Annualized Cost:	$14,016	$20,227

A.1.2 Timing Between Initial Investment and Operation

A business cannot begin to depreciate a capital investment before it goes into operation. Although the midyear convention is frequently used when calculating depreciation, it is not appropriate for the analysis in Section Four. Approximately one year would be required to build and install most of the equipment considered in the regulatory alternatives. Additional time might be required for design, permitting, and site preparation. The cost annualization model, therefore, assumes a 1-year delay from the capital expenditure to the beginning of operation. As shown in Table A-2, the capital expenditure is listed in Year 1, but depreciation and annual O&M costs are not listed until Year 2 (assumed to be the first full year of operation). The 1-year delay also changes each year's depreciation rates (see column 2).

A.1.3 Depreciable Lifetime for the Equipment

Tables A-4 through A-8 present an analysis of the sensitivity of annualized cost estimates to changes in depreciation methods and project lifetime. The annualized cost model specifies 20 to 25-year service lifetimes for wastewater treatment technology. According to the IRS tax code, capital equipment with that service life should be depreciated over 15 years. Fifteen years is also the EPA standard project life used for analysis of impacts for effluent guidelines. The tables test the effects of changes in depreciation methods and schedules on estimates of annualized costs; significant changes in annualized cost estimates could cause significant changes in cost effectiveness calculations and impact estimates.

Table A-4 presents estimates of pre- and posttax annualized compliance costs and the present value of total pre- and posttax costs over the project lifetime for the pharmaceuticals industry for the selected options. The standard estimates use the 15-year accelerated depreciation and 15-year project life, which are the current assumptions in the pharmaceutical analyses to date. The figures shown in Table A-5 for a hypothetical facility therefore match the way in which costs were calculated for the current impact analyses. Variation 1 uses a 15-year straight-line depreciation and 15-year project life. The only difference between the standard version and Variation 1 occurs in posttax cost estimates because the change in the depreciation method only changes the size and timing of the tax shield. Posttax annualized costs under Variation 1 exceed standard cost estimates by less than one percent. The present value of posttax costs for Variation 1 exceeds

Table A-4

Sensitivity Analysis of Annualized Cost Estimation to Depreciation and Project Life for All Affected Pharmaceutical Facilities

Cost	Standard	Variation 1	Variation 2	Variation 3
		BAT-A/C		
Capital	$3,532,000	$3,532,000	$3,532,000	$3,532,000
O&M	$2,165,000	$2,165,000	$2,165,000	$2,165,000
Annualized, post-tax	$1,565,871	$1,571,254	$1,547,865	$1,618,954
Annualized, pre-tax	$2,461,257	$2,461,257	$2,461,257	$2,545,478
Present Value, post-tax	$14,792,237	$14,843,082	$14,622,135	$9,667,256
Present Value, pre-tax	$23,250,634	$23,250,634	$23,250,634	$15,199,812
		BAT-B/D		
Capital	$0	$0	$0	$0
O&M	$0	$0	$0	$0
Annualized, post-tax	$0	$0	$0	$0
Annualized, pre-tax	$0	$0	$0	$0
Present Value, post-tax	$0	$0	$0	$0
Present Value, pre-tax	$0	$0	$0	$0
		BPT-A/C		
Capital	$2,879,000	$2,879,000	$2,879,000	$2,879,000
O&M	$2,293,000	$2,293,000	$2,293,000	$2,293,000
Annualized, post-tax	$1,589,836	$1,594,223	$1,575,158	$1,613,073
Annualized, pre-tax	$2,515,543	$2,515,543	$2,515,543	$2,551,646
Present Value, post-tax	$15,018,617	$15,060,063	$14,879,964	$9,632,141
Present Value, pre-tax	$23,763,447	$23,763,447	$23,763,447	$15,236,641
		BPT-B/D		
Capital	$3,840,000	$3,840,000	$3,840,000	$3,840,000
O&M	$1,400,000	$1,400,000	$1,400,000	$1,400,000
Annualized, post-tax	$1,136,456	$1,142,308	$1,116,879	$1,230,333
Annualized, pre-tax	$1,756,293	$1,756,293	$1,756,293	$1,906,621
Present Value, post-tax	$10,735,701	$10,790,980	$10,550,766	$7,346,687
Present Value, pre-tax	$16,591,080	$16,591,080	$16,591,080	$11,385,005
		PSES-A/C		
Capital	$88,237,000	$88,237,000	$88,237,000	$88,237,000
O&M	$31,564,000	$31,564,000	$31,564,000	$31,564,000
Annualized, post-tax	$25,754,491	$25,888,954	$25,304,647	$27,934,605
Annualized, pre-tax	$39,772,750	$39,772,750	$39,772,750	$43,264,381
Present Value, post-tax	$243,293,623	$244,563,853	$239,044,105	$166,805,866
Present Value, pre-tax	$375,719,198	$375,719,198	$375,719,198	$258,344,531
		PSES-B/D		
Capital	$7,789,000	$7,789,000	$7,789,000	$7,789,000
O&M	$5,885,000	$5,885,000	$5,885,000	$5,885,000
Annualized, post-tax	$4,112,172	$4,124,041	$4,072,462	$4,187,121
Annualized, pre-tax	$6,498,503	$6,498,503	$6,498,503	$6,615,809
Present Value, post-tax	$38,846,242	$38,958,370	$38,471,122	$25,002,549
Present Value, pre-tax	$61,389,074	$61,389,074	$61,389,074	$39,504,968

Standard: 15-year accelerated depreciation, 15-year project lifetime
Variation 1: 15-year straight-line depreciation, 15-year project lifetime
Variation 2: 7-year straight-line depreciation, 15-year project lifetime
Variation 3: 7-year straight-line depreciation, 7-year project lifetime

Table A-5

Sample Spreadsheet for Annualizing Costs
Standard: 15-Year Accelerated Depreciation, 15-Year Project Lifetime

INPUTS	
Facility Code:	30387
	$1990
Initial Capital Cost ($):	$3,532,000
Annual Operation & Maintenance Cost ($):	$2,165,000
Real Discount Rate:	7.0%
Marginal Income Tax Rates:	
Federal	34.00%
State	6.75%
Combined	38.46%

Column 1	2	3	4	5	6	7	8
Year	Depreciation Rate	Depreciation For Year	Tax Shield From Depreciation	O&M Cost	O&M Tax Shield	Cash Outflow	Cash Outflow After Tax Shields
1	0.000%	$0	$0	$0	$0	$3,532,000	$3,532,000
2	10.000%	$353,200	$135,823	$2,165,000	$832,551	$2,165,000	$1,196,626
3	9.643%	$340,586	$130,972	$2,165,000	$832,551	$2,165,000	$1,201,477
4	9.272%	$327,486	$125,935	$2,165,000	$832,551	$2,165,000	$1,206,514
5	8.886%	$313,841	$120,688	$2,165,000	$832,551	$2,165,000	$1,211,762
6	5.655%	$199,717	$76,801	$2,165,000	$832,551	$2,165,000	$1,255,648
7	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641
8	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641
9	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641
10	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641
11	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641
12	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641
13	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641
14	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641
15	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641
16	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641
Sum	100.00%	$3,532,176	$1,358,298	$32,475,000	$12,488,261	$36,007,000	$22,160,440
Present Value		$2,276,938	$875,597	$19,718,634	$7,582,801	$23,250,634	$14,792,237

	After Tax Shield	Before Tax Shield
Present Value of Incremental Costs:	$14,792,237	$23,250,634
Annualized Cost:	$1,565,871	$2,461,257

Table A-6

Sample Spreadsheet for Annualizing Costs
Variation 1: 15-Year Straight-line Depreciation, 15-Year Project Lifetime

INPUTS

Facility Code:	30387
	$1990
Initial Capital Cost ($):	$3,532,000
Annual Operation & Maintenance Cost ($):	$2,165,000
Real Discount Rate:	7.0%
Marginal Income Tax Rates:	
Federal	34.00%
State	6.75%
Combined	38.46%

Column 1	2	3	4	5	6	7	8
Year	Depreciation Rate	Depreciation For Year	Tax Shield From Depreciation	O&M Cost	O&M Tax Shield	Cash Outflow	Cash Outflow After Tax Shields
1	0.00%	$0	$0	$0	$0	$3,532,000	$3,532,000
2	6.67%	$235,478	$90,553	$2,165,000	$832,551	$2,165,000	$1,241,896
3	6.67%	$235,478	$90,553	$2,165,000	$832,551	$2,165,000	$1,241,896
4	6.67%	$235,478	$90,553	$2,165,000	$832,551	$2,165,000	$1,241,896
5	6.67%	$235,478	$90,553	$2,165,000	$832,551	$2,165,000	$1,241,896
6	6.67%	$235,478	$90,553	$2,165,000	$832,551	$2,165,000	$1,241,896
7	6.67%	$235,478	$90,553	$2,165,000	$832,551	$2,165,000	$1,241,896
8	6.67%	$235,478	$90,553	$2,165,000	$832,551	$2,165,000	$1,241,896
9	6.67%	$235,478	$90,553	$2,165,000	$832,551	$2,165,000	$1,241,896
10	6.67%	$235,478	$90,553	$2,165,000	$832,551	$2,165,000	$1,241,896
11	6.67%	$235,478	$90,553	$2,165,000	$832,551	$2,165,000	$1,241,896
12	6.67%	$235,478	$90,553	$2,165,000	$832,551	$2,165,000	$1,241,896
13	6.67%	$235,478	$90,553	$2,165,000	$832,551	$2,165,000	$1,241,896
14	6.67%	$235,478	$90,553	$2,165,000	$832,551	$2,165,000	$1,241,896
15	6.67%	$235,478	$90,553	$2,165,000	$832,551	$2,165,000	$1,241,896
16	6.67%	$235,478	$90,553	$2,165,000	$832,551	$2,165,000	$1,241,896
Sum	100.00%	$100,000	$1,358,299	$32,475,000	$12,488,261	$36,007,000	$22,160,440
Present Value		$2,144,717	$824,751	$19,718,634	$7,582,801	$23,250,634	$14,843,082

	After Tax Shield	Before Tax Shield
Present Value of Incremental Costs:	$14,843,082	$23,250,634
Annualized Cost:	$1,571,254	$2,461,257

Table A-7

Sample Spreadsheet for Annualizing Costs
Variation 2: 7-Year Straight-line Depreciation, 15-Year Project Lifetime

INPUTS

Survey ID #:	30387
	$1990
Initial Capital Cost ($):	$3,532,000
Annual Operation & Maintenance Cost ($):	$2,165,000
Real Discount Rate:	7.0%
Marginal Income Tax Rates:	
Federal	34.00%
State	6.75%
Combined	38.46%

Column 1	2	3	4	5	6	7	8
Year	Depreciation Rate	Depreciation For Year	Tax Shield From Depreciation	O&M Cost	O&M Tax Shield	Cash Outflow	Cash Outflow After Tax Shields
1	0.00%	$0	$0	$0	$0	$3,532,000	$3,532,000
2	14.29%	$504,571	$194,033	$2,165,000	$832,551	$2,165,000	$1,138,417
3	14.29%	$504,571	$194,033	$2,165,000	$832,551	$2,165,000	$1,138,417
4	14.29%	$504,571	$194,033	$2,165,000	$832,551	$2,165,000	$1,138,417
5	14.29%	$504,571	$194,033	$2,165,000	$832,551	$2,165,000	$1,138,417
6	14.29%	$504,571	$194,033	$2,165,000	$832,551	$2,165,000	$1,138,417
7	14.29%	$504,571	$194,033	$2,165,000	$832,551	$2,165,000	$1,138,417
8	14.29%	$504,571	$194,033	$2,165,000	$832,551	$2,165,000	$1,138,417
9		$0	$0	$2,165,000	$832,551	$2,165,000	$1,332,449
10		$0	$0	$2,165,000	$832,551	$2,165,000	$1,332,449
11		$0	$0	$2,165,000	$832,551	$2,165,000	$1,332,449
12		$0	$0	$2,165,000	$832,551	$2,165,000	$1,332,449
13		$0	$0	$2,165,000	$832,551	$2,165,000	$1,332,449
14		$0	$0	$2,165,000	$832,551	$2,165,000	$1,332,449
15		$0	$0	$2,165,000	$832,551	$2,165,000	$1,332,449
16		$0	$0	$2,165,000	$832,551	$2,165,000	$1,332,449
Sum	100.00%	$3,531,996	$1,358,229	$32,475,000	$12,488,261	$36,007,000	$22,160,510
Present Value		$2,719,279	$1,045,699	$19,718,634	$7,582,801	$23,250,634	$14,622,135

	After Tax Shield	Before Tax Shield
Present Value of Incremental Costs:	$14,622,135	$23,250,634
Annualized Cost:	$1,547,865	$2,461,257

Table A-8

Sample Spreadsheet for Annualizing Costs
Variation 3: 7-Year Straight-line Depreciation, 7-Year Project Lifetime

INPUTS

Survey ID #:	30387
	$1990
Initial Capital Cost ($):	$3,532,000
Annual Operation & Maintenance Cost ($):	$2,165,000
Real Discount Rate:	7.0%
Marginal Income Tax Rates:	
Federal	34.00%
State	6.75%
Combined	38.46%

Column 1	2	3	4	5	6	7	8
Year	Depreciation Rate	Depreciation For Year	Tax Shield From Depreciation	O&M Cost	O&M Tax Shield	Cash Outflow	Cash Outflow After Tax Shields
1	0.00%	$0	$0	$0	$0	$3,532,000	$3,532,000
2	14.29%	$504,571	$194,033	$2,165,000	$832,551	$2,165,000	$1,138,417
3	14.29%	$504,571	$194,033	$2,165,000	$832,551	$2,165,000	$1,138,417
4	14.29%	$504,571	$194,033	$2,165,000	$832,551	$2,165,000	$1,138,417
5	14.29%	$504,571	$194,033	$2,165,000	$832,551	$2,165,000	$1,138,417
6	14.29%	$504,571	$194,033	$2,165,000	$832,551	$2,165,000	$1,138,417
7	14.29%	$504,571	$194,033	$2,165,000	$832,551	$2,165,000	$1,138,417
8	14.29%	$504,571	$194,033	$2,165,000	$832,551	$2,165,000	$1,138,417
9		$0	$0	$0	$0	$0	$0
10		$0	$0	$0	$0	$0	$0
11		$0	$0	$0	$0	$0	$0
12		$0	$0	$0	$0	$0	$0
13		$0	$0	$0	$0	$0	$0
14		$0	$0	$0	$0	$0	$0
15		$0	$0	$0	$0	$0	$0
16		$0	$0	$0	$0	$0	$0
Sum	100.00%	$3,531,996	$1,358,229	$15,155,000	$5,827,855	$18,687,000	$11,500,916
Present Value		$2,719,279	$1,045,699	$11,667,812	$4,486,857	$15,199,812	$9,667,256

	After Tax Shield	Before Tax Shield
Present Value of Incremental Costs:	$9,667,256	$15,199,812
Annualized Cost:	$1,618,954	$2,545,478

those of the standard estimate by a similar percentage. Variation 2 uses a 7-year straight-line depreciation method and a 15-year project life. This results in slightly smaller estimates of posttax annualized costs and the present value of posttax costs than using Variation 1 or the standard analysis. Variation 3 presents estimates using 7-year straight-line depreciation and a 7-year project life. The present value of costs is smaller under Variation 3 than the other methods, however, annualized cost estimates are higher.

Tables A-5 through A-8 provide an illustration of why these results occur. These exhibits present a sample cost annualization spreadsheet calculation for a fictitious facility under the four variations described above. The same data is used in each calculation; the only difference between exhibits is the depreciation method and project life. The fictitious facility has capital costs of $3,532,000 and annual operating and maintenance (O&M) costs of $2,165,000. Table A-5 presents the standard calculation.[3] When compared with Variation 1 (Table A-6), the accelerated depreciation (Table A-5) provides larger tax shields to the facility in the early years of the project, when the present value of a dollar is greater, than in later years. Thus the present value of the tax shield from depreciation is larger under the standard method than under Variation 1, and the present value of posttax costs and posttax annualized costs are both smaller. The depreciation and tax shield from depreciation (columns 3 and 4 of the sample spreadsheet) are the only differences between the two versions. A 7-year depreciation period with a 15-year project life (Variation 2, Table A-7) produces essentially the same results. The 7-year depreciation period, although using the straight-line method, moves more of the depreciation and tax shield from depreciation into the early years, when the present value of a dollar is greater than in later years. Finally, the present value of costs under Variation 3 (Table A-8) is smaller than the other options because only seven years of O&M costs are included. However, the annualized costs under Variation 3 (Table A-8) are greater because the stream of costs was annualized over 8 years instead of 16. Thus annualized costs under Variation 3 are slightly larger than those calculated assuming longer project lives.

It is clear that changes in the project life have a much larger impact on annualized cost estimates than changes in the method of depreciation. In fact, if the pharmaceuticals industry depreciates its capital costs over 7 years instead of 15, posttax annualized compliance costs will be smaller than those estimated by the current cost annualization methodology. Changing the period of depreciation does not imply changing the

[3] Note that the methodology assumes the wastewater treatment technology takes one year to purchase and install. The cost annualization model charges all capital costs to the first year.

project lifetime, therefore the 7-year depreciation period is compatible with the 15-year project analysis period. Only if the equipment truly has a life less than 15 years will the annualized costs be substantially greater. It is highly unlikely that pollution control equipment will need to be replaced in less than 15 years, otherwise IRS would have difficulty mandating a 15-year depreciable life on this type of equipment. IRS sets the 15-year depreciable life because the actual expected life is generally greater, i.e., 20 to 25 years.

A.1.4 Tax Shields on Interest Payments

The cost annualization model does not consider tax shields on interest paid to finance new pollution control equipment. A facility could finance the investment through a bank loan (debt), money from working capital, issuance of a corporate bond, or selling additional stock (equity shares). In any case, the cost annualization model assumes a cost to the facility to use the money (the discount/interest rate), whether the money is paid as interest or is the opportunity cost of internal funding. According to current tax law, if a facility finances the investment using debt, the associated interest expenses can be deducted, thereby reducing taxable income.[4] The tax shield on the interest payments, therefore, would reduce the after-tax annualized cost. It is not known what mix of debt and capital a facility will use to finance the cost of pollution control equipment. According to Table A-9, which illustrates the effects of 100-percent debt financing, the after-tax annualized cost would drop by approximately 3 percent due to tax shields on the interest payments. If the facility financed the entire investment out of working capital, there would be no associated tax benefit and the after-tax cost should be calculated without interest tax shields. To maintain a conservative estimate of the after-tax annualized cost, tax shields on interest payments are not included in the cost annualization model.

A.1.5 Discount Rates

A company can use internal financing, external financing, or some combination to raise the capital for upgrading its wastewater treatment system. Retained earnings and working capital are examples of internal funding sources. Debt and external equity (stock issuance) are examples of external funding sources.

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[4] CCH, 1994, *State Tax Handbook*. Chicago, IL: CCH.

Table A-9

Spreadsheet for Annualizing Costs with Interest Payments

INPUTS

Facility Type:	30387
Facility Code:	AC/Direct
Option Number:	BAT/Opt. 1
Initial Capital Cost ($):	$3,532,000
Annual Operation & Maintenance Cost ($):	$2,165,000
Real Discount Rate:	7.0%
Marginal Income Tax Rates:	
Federal	34.00%
State	6.75%
Combined	38.46%

Column 1	2	3	4	5	6	7	8	9	10
Year	Depreciation Rate	Depreciation For Year	Tax Shield From Depreciation	O&M Cost	O&M Tax Shield	Cash Outflow	Cash Outflow After Tax Shields	Interest Payments	Interest Payment Tax Shield
1	0.000%	$0	$0	$0	$0	$3,532,000	$3,532,000	$0	$0
2	10.000%	$353,200	$135,823	$2,165,000	$832,551	$2,165,000	$1,196,626	$0	$0
3	9.643%	$340,586	$130,972	$2,165,000	$832,551	$2,165,000	$1,201,477	$0	$0
4	9.272%	$327,486	$125,935	$2,165,000	$832,551	$2,165,000	$1,206,514	$0	$0
5	8.886%	$313,841	$120,688	$2,165,000	$832,551	$2,165,000	$1,211,762	$0	$0
6	5.655%	$199,717	$76,801	$2,165,000	$832,551	$2,165,000	$1,255,648	$0	$0
7	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641	$0	$0
8	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641	$0	$0
9	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641	$0	$0
10	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641	$0	$0
11	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641	$0	$0
12	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641	$0	$0
13	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641	$0	$0
14	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641	$0	$0
15	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641	$0	$0
16	5.655%	$199,735	$76,808	$2,165,000	$832,551	$2,165,000	$1,255,641	$0	$0
Sum	100.00%	$3,532,176	$1,358,298	$32,475,000	$12,488,261	$36,007,000	$22,160,440	$0	$0
Present Value		$861,621	$331,336	$6,288,687	$2,418,315	$9,820,687	$7,071,036	$0	$0

	After Tax Shield	Before Tax Shield
Present Value of Incremental Costs:	$7,071,036	$9,820,687
Annualized Cost:	$2,426,608	$3,370,221
Annualized Interest Tax Shield:	$0	
Annualized Cost After Interest Tax Shield:	$2,426,608	

Notes: This spreadsheet assumes that a modified accelerated cost recovery system (MACRS) is used to depreciate capital expenditures.

The respondents supplied their discount rate (defined as the weighted average marginal cost of capital given their mix of debt and equity) in the Section 308 Survey.

The Agency does not use the discount rate provided by the facility, but assumes a discount rate of 7 percent in the cost annualization model based on a social discount rate provided in OMB Guidance.[5]

A.2 AVERAGE STATE TAX RATE

Table A-10 lists each state's top corporate and individual tax rates and calculates national average state tax rates.[6] The cost annualization model uses the average state tax rate because of the complexities in the industry; for example, a facility could be located in one state, while its corporate headquarters are located in a second state. Given the uncertainty over which state tax rate applies to a given facility's revenues the average state tax rate is used in the cost annualization model for all facilities. The average rate over all states is 6.75 percent.

A.3 COST ANNUALIZATION MODEL AND TOTAL COST ASSESSMENT

The Total Cost Assessment (TCA) approach for evaluating pollution prevention alternatives is a comprehensive financial analysis of the life-cycle costs and savings of a pollution prevention project.[7] A TCA approach includes:

- Internal allocation of environmental costs to product lines or processes through full cost accounting.

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[5] OMB, 1996. *Economic Assessment of Federal Regulations Under Executive Order No. 12866.* January 11.

[6] CCH, 1994. *Op. cit.*

[7] U.S. EPA, 1992. *Total Cost Assessment: Accelerating Industrial Pollution Prevention Through Innovative Project Financial Analysis*. Washington, D.C.: U.S. EPA, Office of Pollution Prevention and Toxics.

Table A-10

State Income Tax Rates

State	Corporate Income Tax Rate	Basis for States with Graduated Tax Tables	Personal Income Tax Upper Rate	Basis for States with Graduated Tax Tables
Alabama	5.00%		5.00%	$3,000+
Alaska	9.40%	$90,000+	0.00%	
Arizona	9.00%		6.90%	$150,000+
Arkansas	6.50%	$100,000+	7.00%	$25,000+
California	9.30%		11.00%	$215,000+
Colorado	5.00%		5.00%	
Connecticut	11.50%		4.50%	
Delaware	8.70%		7.70%	$40,000+
Florida	5.50%		0.00%	
Georgia	6.00%		6.00%	$7,000+
Hawaii	6.40%	$100,000+	10.00%	$21,000+
Idaho	8.00%		8.20%	$20,000+
Illinois	4.80%		3.00%	
Indiana	3.40%		3.40%	
Iowa	12.00%	$250,000+	9.98%	$47,000+
Kansas	4.00%	$50,000+	7.75%	$30,000+
Kentucky	8.25%	$250,000+	6.00%	$8,000+
Louisiana	8.00%	$200,000+	6.00%	$50,000+
Maine	8.93%	$250,000+	8.50%	$33,000+
Maryland	7.00%		6.00%	$100,000+
Massachusetts	9.50%		5.95%	
Michigan	2.30%		4.40%	
Minnesota	9.80%		8.50%	$50,000+
Mississippi	5.00%	$10,000+	5.00%	$10,000+
Missouri	6.25%		6.00%	$9,000+
Montana	6.75%		11.00%	$63,000+
Nebraska	7.81%	$50,000+	6.99%	$27,000+
Nevada	0.00%		0.00%	
New Hampshire	7.00%		0.00%	
New Jersey	7.25%		6.65%	$75,000+
New Mexico	7.60%	$1Million+	8.50%	$42,000+
New York	9.00%		7.88%	$13,000+
North Carolina	7.75%		7.75%	$60,000+
North Dakota	10.50%	$50,000+	12.00%	$50,000+
Ohio	8.90%	Based on Stock Value	7.50%	$200,000+
Oklahoma	6.00%		7.00%	$10,000+
Oregon	6.60%		9.00%	$5,000+
Pennsylvania	9.90%	1997 and thereafter	2.80%	
Rhode Island *	9.00%		10.40%	$250,000+
South Carolina	5.00%		7.00%	$11,000+
South Dakota	0.00%		0.00%	
Tennesee	6.00%		0.00%	
Texas	0.00%		0.00%	
Utah	5.00%		7.20%	$4,000+
Vermont *	8.25%	$250,000+	9.45%	$250,000+
Virginia	6.00%		5.75%	$17,000+
Washington	0.00%		0.00%	
West Virginia	9.00%		6.50%	$60,000+
Wisconsin	7.90%		6.93%	$20,000+
Wyoming	0.00%		0.00%	
Average:	6.61%		5.84%	

Notes: Basis for rates is reported to nearest $1,000.
Personal income tax rates for Rhode Island and Vermont based on federal tax (not taxable income).
Tax rates given here are equivalents for highest personal federal tax rate.

Source: CCH, Inc., 1994. State Tax Handbook. Chicago, IL: CCH.
Personal communication, Maureen Kaplan, ERG, and Commerce Clearinghouse (CCH) Inc., to resolve discrepancies on tax rate for Missouri and Rhode Island, March 30, 1995.

- Financial analysis of direct and indirect costs, short- and long-term costs, liability costs, and less tangible benefits of an investment.
- Evaluation of project costs and savings over a long-time horizon, e.g., 10 to 15 years.
- Measures of profitability that capture the long-term profitability of the project, e.g., net present value and internal rate of return.

TCA approaches are being developed as alternatives to traditional financial analysis methods to capture and properly evaluate the long-term costs and savings inherent in pollution prevention activities.

The cost annualization model incorporates several features of a total cost assessment analysis, including:

- Long-time horizon (the annualization model uses a 15-year time frame).
- Short- and long-term costs.
- Depreciation, taxes, inflation, and discount rate.
- The associated closure analysis (Section Five), which uses the net present value of the investment calculated in the cost annualization model to evaluate the long-term impacts on profitability.

The economic analysis differs from the TCA approach in that it does not include a "liability avoided" component or an evaluation of the less tangible benefits of the regulation. There are insufficient data to estimate potential future liability costs for each facility. The exclusion of this parameter results in a more conservative analysis where potential impacts are not offset by avoiding future liability costs. A separate analysis and report compare the costs and benefits of the regulation.

APPENDIX B

MACT CAPITAL AND OPERATING AND MAINTENANCE COSTS

Table B-1 presents the MACT standards costs that the Office of Water (OW) received from the Office of Air Quality Planning and Standards (OAQPS) for the facilities in the Final Pharmaceutical Industry Effluent Guidelines analysis. The costs, which were originally in 1995 dollars, were deflated to 1990 dollars for use in the cost annualization model (see Section Four) to calculate the baselines discussed in Sections Five and Six. The MACT capital cost for wastewater emissions control is $30,907,772 and the O & M cost for this component is $5,644,605. For all facilities in the Final Pharmaceutical Industry Effluent Guideline analyses, the total MACT standards capital cost is $102,822,547 and O & M is $30,535,434. Table B-2 and B-3 present the MACT standards costs as received by EPA, in 1995 dollars and for all facilities, including some that are not in the Final Pharmaceutical Industry Effluent Guideline analysis.

Table B-2 presents costs associated with air emission controls and Table B-3 presents costs for wastewater emission controls as well as the total costs for the MACT standards rule (the total costs are the sum of costs for air emission controls and wastewater emission controls). Note than an additional $17,441,041 in capital costs and $5,471,834 in O & M costs are estimated to be incurred by pharmaceutical facilities that are not in the Final Pharmaceutical Industry Effluent Guideline analyses.

Two numbering schemes were assigned to facilities for OAQPS MACT standards costs: a facility number and a plant number. The facility numbers were generated by OAQPS based on the number of pharmaceutical facilities which were sent questionnaires. Of the OAQPS facilities, there are 101 major sources covered under the air regulation. These 101 facilities, which correspond to the numbers in the Air Proposal Economic Impact Assessment, were numbered 1 through 99 in the cost data (one facility was found to be a duplicate and an additional three were not assigned costs) and were matched up to the corresponding OW 30000 facility codes using wastewater impacts listed by stream. OW matched the streams by process of elimination based on OAQPS' description of the streams and its costing for plant process vents and storage tanks. However, not all of the plant numbers from OAQPS have OW facility codes because some plants regulated under the MACT rule do not face effluent guidelines regulation. Also, many of the facilities in the Final Pharmaceutical Industry Effluent Guidelines analysis do not face MACT standards regulation. OAQPS

Table B-1

Capital and O&M Costs for MACT Standards Rule
Final Pharmaceutical Industry Effluent Guideline Facilities Only
(1990 Dollars)*

Plant Number	Facility ID	Total Wastewater Costs		Total Costs	
		Capital	O & M	Capital	O & M
4	30122	$0	$0	$19,059	$7,960
7	30547	$0	$0	$568,262	$211,802
8	30278	$0	$0	$745,452	$227,147
9	30759	$5,153,204	$866,990	$5,744,433	$1,133,147
24	30207	$0	$0	$24,681	$8,185
30	30107	$0	$0	$458,929	$170,245
34	30172	$0	$0	$24,681	$11,343
39	30851	$0	$0	$47,649	$53,064
43	30094	$0	$0	$258,679	$69,525
63	30110	$0	$0	$24,681	$8,185
68	30387	$0	$0	$24,681	$8,185
73	31110	$0	$0	$435,962	$150,634
77	30431	$1,040,441	$206,303	$1,327,709	$298,823
79	30977	$408,121	$76,507	$1,291,494	$368,204
80	30954	$1,911,515	$321,365	$2,341,855	$490,725
87	30756	$527,939	$102,126	$1,078,763	$247,728
95	30071	$0	$0	$47,649	$84,649
106	30228	$0	$0	$24,681	$8,185
120	30965	$0	$0	$24,681	$17,660
121	30762	$0	$0	$573,791	$190,481
122	30639	$0	$0	$877,752	$288,314
124	31040	$0	$0	$6,474,787	$2,144,749
126	30331	$370,706	$70,238	$2,069,098	$645,947
135	30258	$0	$0	$47,649	$12,004
141	30504	$0	$0	$53,271	$28,021
145	30125	$0	$0	$19,059	$55,337
160	31123	$0	$0	$430,340	$140,934
168	30701	$0	$0	$311,204	$80,878
169	30329	$0	$0	$6,027,034	$2,270,742
186	30401	$0	$0	$875,831	$293,969
193	30900	$0	$0	$1,106,221	$399,402
196	30022	$0	$0	$1,692,770	$569,167
198	30610	$524,993	$101,320	$2,217,763	$676,804
203	31164	$711,192	$152,220	$6,091,105	$2,069,753
204	31112	$0	$0	$596,851	$212,687
212	30147	$0	$0	$562,640	$211,577
220	30540	$0	$0	$1,660,952	$578,765
221	30010	$6,830,432	$1,149,271	$8,359,084	$1,654,234
222	30767	$0	$0	$4,421,834	$1,545,187
223	30884	$0	$0	$830,849	$289,820
224	30822	$0	$0	$305,582	$80,654
239	31113	$0	$0	$24,681	$8,185
246	31121	$596,753	$120,937	$650,023	$142,641
247	31120	$452,418	$83,255	$1,705,319	$502,771
249	30050	$0	$0	$568,262	$205,485
260	30548	$0	$0	$264,301	$69,750
270	30864	$1,030,113	$173,440	$1,054,794	$181,625
271	30918	$817,967	$181,408	$1,414,819	$397,254
279	30819	$0	$0	$458,929	$173,404
280	30542	$0	$0	$1,385,201	$490,159
310	30690	$0	$0	$1,258,523	$457,642
313	30910	$0	$0	$47,649	$30,955
314	30694	$0	$0	$305,582	$83,812
318	30931	$0	$0	$2,926,611	$980,723
326	30279	$0	$0	$1,088,782	$339,519
331	30299	$0	$0	$19,059	$7,960
332	30618	$0	$0	$24,681	$27,136
333	30487	$0	$0	$1,281,490	$493,046
337	31078	$0	$0	$592,105	$156,506
339	30949	$1,910,594	$387,181	$5,814,388	$1,547,720
343	30398	$0	$0	$1,684,012	$642,031
344	30033	$517,599	$99,300	$570,870	$143,113
350	30366	$757,596	$164,905	$805,244	$176,909
351	30457	$964,546	$190,145	$1,834,755	$480,730
354	31056	$0	$0	$311,204	$80,878
358	30832	$2,231,667	$462,593	$7,625,960	$2,260,110
359	31029	$3,831,112	$672,526	$5,406,667	$1,163,349
379	30905	$0	$0	$19,059	$61,654
381	31092	$316,154	$62,082	$335,213	$70,042
397	31163	$0	$0	$1,385,201	$487,000
398	30117	$0	$0	$1,830,692	$655,828
Total		$30,905,061	$5,644,110	$102,813,530	$30,532,756

* Deflated from 1995 dollars using ENR Construction Cost Index.

Source: Data provided by U.S. EPA, Office of Air Quality Planning and Standards.

Table B-2

MACT Standards Air Emission Control Costs (1995 dollars)

Plant Number	Facility ID	Equipment Leaks		Dedicated Process Vents		Nondedicated Process Vents		Storage Tanks	
		Total Capital	Annual O&M	Total Capital	Annual O&M	Total Capital	Annual O&M	Total Capital	Annual O&M
4	30122	$0	$3,652	$0	$0	$0	$0	$22,036	$5,551
7	30547	$6,500	$11,215	$628,472	$228,113	$0	$0	$22,036	$5,551
8	30278	$0	$7,304	$331,269	$84,046	$475,510	$157,392	$55,090	$13,878
9	30759	$0	$65,732	$628,472	$228,113	$0	$0	$55,090	$13,878
24	30207	$6,500	$3,912	$0	$0	$0	$0	$22,036	$5,551
30	30107	$0	$25,562	$0	$0	$475,510	$157,392	$55,090	$13,878
34	30172	$6,500	$7,564	$0	$0	$0	$0	$22,036	$5,551
39	30851	$0	$47,473	$0	$0	$0	$0	$55,090	$13,878
43	30094	$0	$3,652	$277,041	$71,180	$0	$0	$22,036	$5,551
63	30110	$6,500	$3,912	$0	$0	$0	$0	$22,036	$5,551
68	30387	$6,500	$3,912	$0	$0	$0	$0	$22,036	$5,551
73	31110	$6,500	$11,215	$0	$0	$475,510	$157,392	$22,036	$5,551
77	30431	$0	$21,911	$277,041	$71,180	$0	$0	$55,090	$13,878
79	30977	$6,500	$11,215	$959,741	$312,159	$0	$0	$55,090	$13,878
80	30954	$0	$32,866	$0	$0	$475,510	$157,392	$22,036	$5,551
87	30756	$6,500	$7,564	$608,310	$155,226	$0	$0	$22,036	$5,551
95	30071	$0	$83,990	$0	$0	$0	$0	$55,090	$13,878
106	30228	$6,500	$3,912	$0	$0	$0	$0	$22,036	$5,551
120	30965	$6,500	$14,867	$0	$0	$0	$0	$22,036	$5,551
121	30762	$0	$51,125	$608,310	$155,226	$0	$0	$55,090	$13,878
122	30639	$0	$7,304	$959,741	$312,159	$0	$0	$55,090	$13,878
124	31040	$0	$29,214	$331,269	$84,046	$7,132,655	$2,360,884	$22,036	$5,551
126	30331	$6,500	$22,171	$0	$0	$1,902,041	$629,569	$55,090	$13,878
135	30258	$0	$0	$0	$0	$0	$0	$55,090	$13,878
141	30504	$6,500	$18,519	$0	$0	$0	$0	$55,090	$13,878
145	30125	$0	$58,428	$0	$0	$0	$0	$22,036	$5,551
160	31123	$0	$0	$0	$0	$475,510	$157,392	$22,036	$5,551
168	30701	$6,500	$3,912	$331,269	$84,046	$0	$0	$22,036	$5,551
169	30329	$0	$102,249	$6,913,191	$2,509,239	$0	$0	$55,090	$13,878
186	30401	$6,500	$11,215	$0	$0	$951,021	$314,785	$55,090	$13,878
193	30900	$0	$0	$1,256,944	$456,225	$0	$0	$22,036	$5,551
196	30022	$0	$14,607	$0	$0	$1,902,041	$629,569	$55,090	$13,878
198	30610	$0	$21,911	$0	$0	$1,902,041	$629,569	$55,090	$13,878
203	31164	$0	$102,249	$1,885,416	$684,338	$4,279,593	$1,416,531	$55,090	$13,878
204	31112	$6,500	$3,912	$628,472	$228,113	$0	$0	$55,090	$13,878
212	30147	$0	$10,955	$628,472	$228,113	$0	$0	$22,036	$5,551

Table B-2 (continued)

Plant Number	Facility ID	Equipment Leaks		Dedicated Process Vents		Nondedicated Process Vents		Storage Tanks	
		Total Capital	Annual O&M	Total Capital	Annual O&M	Total Capital	Annual O&M	Total Capital	Annual O&M
220	30540	$0	$43,821	$1,865,254	$611,451	$0	$0	$55,090	$13,878
221	30010	$0	$29,214	$1,236,782	$383,339	$475,510	$157,392	$55,090	$13,878
222	30767	$0	$105,901	$4,581,794	$1,509,329	$475,510	$157,392	$55,090	$13,878
223	30884	$0	$21,911	$905,513	$299,293	$0	$0	$55,090	$13,878
224	30822	$0	$3,652	$331,269	$84,046	$0	$0	$22,036	$5,551
239	31113	$6,500	$3,912	$0	$0	$0	$0	$22,036	$5,551
246	31121	$6,500	$11,215	$0	$0	$0	$0	$55,090	$13,878
247	31120	$0	$7,304	$0	$0	$1,426,531	$472,177	$22,036	$5,551
249	30050	$6,500	$3,912	$628,472	$228,113	$0	$0	$22,036	$5,551
260	30548	$6,500	$3,912	$277,041	$71,180	$0	$0	$22,036	$5,551
270	30864	$6,500	$3,912	$0	$0	$0	$0	$22,036	$5,551
271	30918	$6,500	$7,564	$628,472	$228,113	$0	$0	$55,090	$13,878
279	30819	$0	$29,214	$0	$0	$475,510	$157,392	$55,090	$13,878
280	30542	$0	$18,259	$628,472	$228,113	$951,021	$314,785	$22,036	$5,551
310	30690	$6,500	$51,385	$0	$0	$1,426,531	$472,177	$22,036	$5,551
313	30910	$0	$21,911	$0	$0	$0	$0	$55,090	$13,878
314	30694	$0	$7,304	$331,269	$84,046	$0	$0	$22,036	$5,551
318	30931	$0	$18,259	$0	$0	$3,328,572	$1,101,746	$55,090	$13,878
326	30279	$0	$3,652	$1,236,782	$383,339	$0	$0	$22,036	$5,551
331	30299	$0	$3,652	$0	$0	$0	$0	$22,036	$5,551
332	30618	$6,500	$25,822	$0	$0	$0	$0	$22,036	$5,551
333	30487	$0	$83,990	$0	$0	$1,426,531	$472,177	$55,090	$13,878
337	31078	$0	$7,304	$662,538	$168,093	$0	$0	$22,036	$5,551
339	30949	$0	$47,473	$3,507,342	$965,645	$951,021	$314,785	$55,090	$13,878
343	30398	$6,500	$44,081	$1,885,416	$684,338	$0	$0	$55,090	$13,878
344	30033	$6,500	$36,778	$0	$0	$0	$0	$55,090	$13,878
350	30366	$0	$0	$0	$0	$0	$0	$55,090	$13,878
351	30457	$0	$7,304	$0	$0	$951,021	$314,785	$55,090	$13,878
354	31056	$6,500	$3,912	$331,269	$84,046	$0	$0	$22,036	$5,551
358	30832	$0	$18,259	$0	$0	$6,181,634	$2,046,100	$55,090	$13,878
359	31029	$0	$0	$1,291,010	$396,205	$475,510	$157,392	$55,090	$13,878
379	30905	$0	$65,732	$0	$0	$0	$0	$22,036	$5,551
381	31092	$0	$3,652	$0	$0	$0	$0	$22,036	$5,551
397	31163	$0	$14,607	$628,472	$228,113	$951,021	$314,785	$22,036	$5,551
398	30117	$6,500	$44,081	$628,472	$228,113	$1,426,531	$472,177	$55,090	$13,878

Table B-3

MACT Standards Wastewater Emission Control and Total MACT Standards Costs (1995 dollars)

Plant Number	Facility ID	Partially Soluble Wastewater		Soluble Wastewater		Total Wastewater		Total Costs	
		Total Capital	Annual O&M	Total Capital	Annual O&M	Total Capital	Annual O&M	Total Capital	Annual O&M
4	30122	$0	$0	$0	$0	$0	$0	$22,036	$9,203
7	30547	$0	$0	$0	$0	$0	$0	$657,008	$244,879
8	30278	$0	$0	$0	$0	$0	$0	$861,869	$262,620
9	30759	$5,957,984	$1,002,389	$0	$0	$5,957,984	$1,002,389	$6,641,546	$1,310,111
24	30207	$0	$0	$0	$0	$0	$0	$28,536	$9,463
30	30107	$0	$0	$0	$0	$0	$0	$530,600	$196,833
34	30172	$0	$0	$0	$0	$0	$0	$28,536	$13,115
39	30851	$0	$0	$0	$0	$0	$0	$55,090	$61,351
43	30094	$0	$0	$0	$0	$0	$0	$299,077	$80,383
63	30110	$0	$0	$0	$0	$0	$0	$28,536	$9,463
68	30387	$0	$0	$0	$0	$0	$0	$28,536	$9,463
73	31110	$0	$0	$0	$0	$0	$0	$504,046	$174,159
77	30431	$477,956	$89,124	$724,971	$149,397	$1,202,927	$238,521	$1,535,058	$345,490
79	30977	$471,857	$88,455	$0	$0	$471,857	$88,455	$1,493,188	$425,707
80	30954	$2,210,038	$371,552	$0	$0	$2,210,038	$371,552	$2,707,584	$567,362
87	30756	$0	$0	$610,388	$118,075	$610,388	$118,075	$1,247,234	$286,416
95	30071	$0	$0	$0	$0	$0	$0	$55,090	$97,868
106	30228	$0	$0	$0	$0	$0	$0	$28,536	$9,463
120	30965	$0	$0	$0	$0	$0	$0	$28,536	$20,418
121	30762	$0	$0	$0	$0	$0	$0	$663,400	$220,229
122	30639	$0	$0	$0	$0	$0	$0	$1,014,831	$333,341
124	31040	$0	$0	$0	$0	$0	$0	$7,485,960	$2,479,696
126	30331	$428,599	$81,207	$0	$0	$428,599	$81,207	$2,392,230	$746,825
135	30258	$0	$0	$0	$0	$0	$0	$55,090	$13,878
141	30504	$0	$0	$0	$0	$0	$0	$61,590	$32,397
145	30125	$0	$0	$0	$0	$0	$0	$22,036	$63,979
160	31123	$0	$0	$0	$0	$0	$0	$497,546	$162,944
168	30701	$0	$0	$0	$0	$0	$0	$359,805	$93,509
169	30329	$0	$0	$0	$0	$0	$0	$6,968,281	$2,625,366
186	30401	$0	$0	$0	$0	$0	$0	$1,012,611	$339,878
193	30900	$0	$0	$0	$0	$0	$0	$1,278,980	$461,777
196	30022	$0	$0	$0	$0	$0	$0	$1,957,131	$658,054
198	30610	$0	$0	$606,981	$117,143	$606,981	$117,143	$2,564,112	$782,501
203	31164	$0	$0	$822,259	$175,992	$822,259	$175,992	$7,042,358	$2,392,988
204	31112	$0	$0	$0	$0	$0	$0	$690,062	$245,903
212	30147	$0	$0	$0	$0	$0	$0	$650,508	$244,619

Table B-3 (continued)

Plant Number	Facility ID	Partially Soluble Wastewater		Soluble Wastewater		Total Wastewater		Total Costs	
		Total Capital	Annual O&M	Total Capital	Annual O&M	Total Capital	Annual O&M	Total Capital	Annual O&M
220	30540	$0	$0	$0	$0	$0	$0	$1,920,344	$669,151
221	30010	$7,897,146	$1,328,753	$0	$0	$7,897,146	$1,328,753	$9,664,529	$1,912,577
222	30767	$0	$0	$0	$0	$0	$0	$5,112,395	$1,786,500
223	30884	$0	$0	$0	$0	$0	$0	$960,603	$335,081
224	30822	$0	$0	$0	$0	$0	$0	$353,305	$93,249
239	31113	$0	$0	$0	$0	$0	$0	$28,536	$9,463
246	31121	$0	$0	$689,948	$139,823	$689,948	$139,823	$751,538	$164,917
247	31120	$523,073	$96,257	$0	$0	$523,073	$96,257	$1,971,640	$581,289
249	30050	$0	$0	$0	$0	$0	$0	$657,008	$237,576
260	30548	$0	$0	$0	$0	$0	$0	$305,577	$80,643
270	30864	$1,190,986	$200,526	$0	$0	$1,190,986	$200,526	$1,219,522	$209,989
271	30918	$0	$0	$945,710	$209,739	$945,710	$209,739	$1,635,772	$459,293
279	30819	$0	$0	$0	$0	$0	$0	$530,600	$200,485
280	30542	$0	$0	$0	$0	$0	$0	$1,601,529	$566,707
310	30690	$0	$0	$0	$0	$0	$0	$1,455,067	$529,113
313	30910	$0	$0	$0	$0	$0	$0	$55,090	$35,789
314	30694	$0	$0	$0	$0	$0	$0	$353,305	$96,901
318	30931	$0	$0	$0	$0	$0	$0	$3,383,662	$1,133,883
326	30279	$0	$0	$0	$0	$0	$0	$1,258,818	$392,542
331	30299	$0	$0	$0	$0	$0	$0	$22,036	$9,203
332	30618	$0	$0	$0	$0	$0	$0	$28,536	$31,374
333	30487	$0	$0	$0	$0	$0	$0	$1,481,621	$570,045
337	31078	$0	$0	$0	$0	$0	$0	$684,574	$180,947
339	30949	$1,038,184	$176,382	$1,170,789	$271,266	$2,208,973	$447,648	$6,722,425	$1,789,428
343	30398	$0	$0	$0	$0	$0	$0	$1,947,006	$742,297
344	30033	$0	$0	$598,433	$114,807	$598,433	$114,807	$660,023	$165,463
350	30366	$0	$0	$875,910	$190,658	$875,910	$190,658	$931,000	$204,536
351	30457	$433,448	$82,262	$681,732	$137,578	$1,115,180	$219,840	$2,121,291	$555,806
354	31056	$0	$0	$0	$0	$0	$0	$359,805	$93,509
358	30832	$1,163,395	$196,322	$1,416,793	$338,514	$2,580,188	$534,836	$8,816,912	$2,613,073
359	31029	$3,658,071	$615,479	$771,349	$162,075	$4,429,420	$777,555	$6,251,030	$1,345,031
379	30905	$0	$0	$0	$0	$0	$0	$22,036	$71,283
381	31092	$365,528	$71,777	$0	$0	$365,528	$71,777	$387,564	$80,980
397	31163	$0	$0	$0	$0	$0	$0	$1,601,529	$563,055
398	30117	$0	$0	$0	$0	$0	$0	$2,116,593	$758,249

has provided OW with costs for 98 facilities, 71 of which overlap with OW regulations. The ultimate mapping of facility numbers (from OAQPS numbers to OW numbers) was generated by OAQPS, in conjunction with OW.