

## 2005 Pollution Abatement Costs and Expenditures (PACE) Survey Guidelines

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## FREQUENTLY ASKED QUESTIONS

### **What is the purpose of this survey?**

This survey collects information on the pollution abatement costs and expenditures related to environmental protection at your specific facility in 2005. Pollution abatement includes treatment/capture, recycling, disposal, and pollution prevention. Pollution abatement costs and expenditures include new capital equipment, annual operating costs, and certain other expenses. The PACE survey only includes expenditures whose primary purpose is environmental protection.

### **How are these data used?**

The Environmental Protection Agency (EPA) uses these data to calculate the costs of regulatory programs. Trade associations, manufacturers, marketing and research companies, universities, financial and environmental institutions, other federal agencies, state and local governments, and environmental reporters also use PACE data.

### **Is your response to this survey mandatory?**

Yes. Responding to the PACE survey is required by law (Title 13, United States Code, Sections 131, 182, 193, 224, and 225). You may visit our website at [www.access.gpo.gov/uscode/title13/title13.html](http://www.access.gpo.gov/uscode/title13/title13.html).

### **Are my data kept confidential?**

Yes. Section 9 of Title 13, United States Code, guarantees that your data are kept confidential. It may be seen only by persons sworn to uphold the confidentiality of Census Bureau information, and may be used only for statistical purposes. The law also provides that copies of your report retained in your files are immune from legal process. You may visit our website at [www.census.gov/privacy/files/data\\_protection/004032.html](http://www.census.gov/privacy/files/data_protection/004032.html).

### **What establishments fill out this form?**

Manufacturing establishments. If you think that your facility is not a manufacturing facility, please call 301-763-1907.

Complete the survey only for the designated facility located at the address printed on the front of the survey form. If your company operates more than one facility, report only for the facility to which this survey was addressed. Do not combine responses with other facilities owned by your company even if operations jointly use the same pollution abatement equipment or staff. Include only corporate expenditures that are billed directly to your facility.

### **What is the reporting period for this survey?**

Report data for the 2005 calendar year. If you cannot report 2005 calendar year data, report data for your 2005 fiscal year.

### **Where do I return the completed form?**

Return your completed form in the enclosed prepaid envelope to:

U.S. Census Bureau  
1201 East 10th Street  
Jeffersonville, IN 47132-0001

If you need additional time to complete this form or if you need a duplicate form, please contact the U.S. Census Bureau at 1-800-528-3049.

### **What is the response burden for this survey?**

The public reporting burden for this collection of information is estimated to average 8 hours per response. Send comments regarding the response burden estimate and any suggestions for minimizing respondent burden, to:

Paperwork Project 0607-0176  
U.S. Census Bureau  
4700 Silver Hill Road, Stop 1500  
Washington, DC 20233-1500

Include the OMB control number in any correspondence. Do NOT send the completed form to this address. You may email comments to [paperwork@census.gov](mailto:paperwork@census.gov); use "Paperwork Project 0607-0176" as the subject.

## SURVEY DEFINITIONS

For this survey, please use the following definitions:

**Facility** is a single physical location where business is conducted or where services or industrial operations are performed. Facilities are often referred to as establishments or plants. A company may have one or more facilities. For this survey, report only for the designated facility located at the address printed on the front of the survey form. Do NOT include data for other facilities owned by the same company when responding to the survey questions.

**Pollution** is a substance in the environment that, because of its chemical composition or quantity, prevents the functioning of natural processes and produces undesirable environmental and/or human health effects. For this survey, report only for the pollutants generated by your facility's production process.

For this survey, pollution is divided into three types of media: air emissions, water discharges, and solid waste.

**Air emissions** are any substances released into the air that could, in high enough concentrations, pose a threat to the environment and/or human health.

**Water discharges** are any substances or pathogens released into water that could, in high enough concentrations, pose a threat to the environment and/or human health.

**Solid waste** includes any waste materials from the production process, including solid, semi-solid, contained liquids, and contained gaseous materials. It includes wastes produced as a result of air and water pollution abatement.

**Pollution abatement activities** are for the purpose of treating, capturing, reducing, eliminating, or disposing of pollution, as defined above. These activities may be in response to federal, state, or local regulations or voluntary initiatives. In addition to the cost of purchasing, installing, and operating pollution abatement equipment, all related **support activities**, including but not limited to monitoring and testing and environmentally-related administrative activities, are to be included in total pollution abatement capital expenditures and operating costs.

For this survey, pollution abatement is divided into four activities: treatment/capture, recycling, disposal, and pollution prevention.

**Treatment/capture activities** are any method, technique, or process designed to remove pollutants, **after** their generation in the production process, from air emissions, water discharges, or solid waste. In general, pollution treatment/capture activities include the use of retrofit technologies, such as baghouses, thermal oxidizers, and oil/water separators. Treatment/capture activities also include those activities designed to change the physical, chemical, or biological character or composition of any pollutant prior to disposal or release into the environment.

**Recycling activities** are the postproduction on-site or off-site processing of waste for an alternative use. Recycling activities include the recovery of liquid, solid, or gaseous wastes and their reuse in the same or another production process. Recycling activities also include the partial reclamation of materials (e.g., metal recovery or the burning of flammable wastes for energy recovery). For this survey, recycling only includes activities whose primary purpose are pollution abatement and NOT activities motivated by profit.

**Disposal activities** involve the final placement, destruction, or disposition of waste after pollution treatment/capture and/or recycling has occurred. Disposal, in an environmentally-sound manner, can include landfill disposal or the use of injection wells. To the extent possible, do not report disposal expenditures associated with waste generated outside the production process, such as office and cafeteria trash, and sanitary sewage. If you are unable to exclude these costs, report all disposal costs.

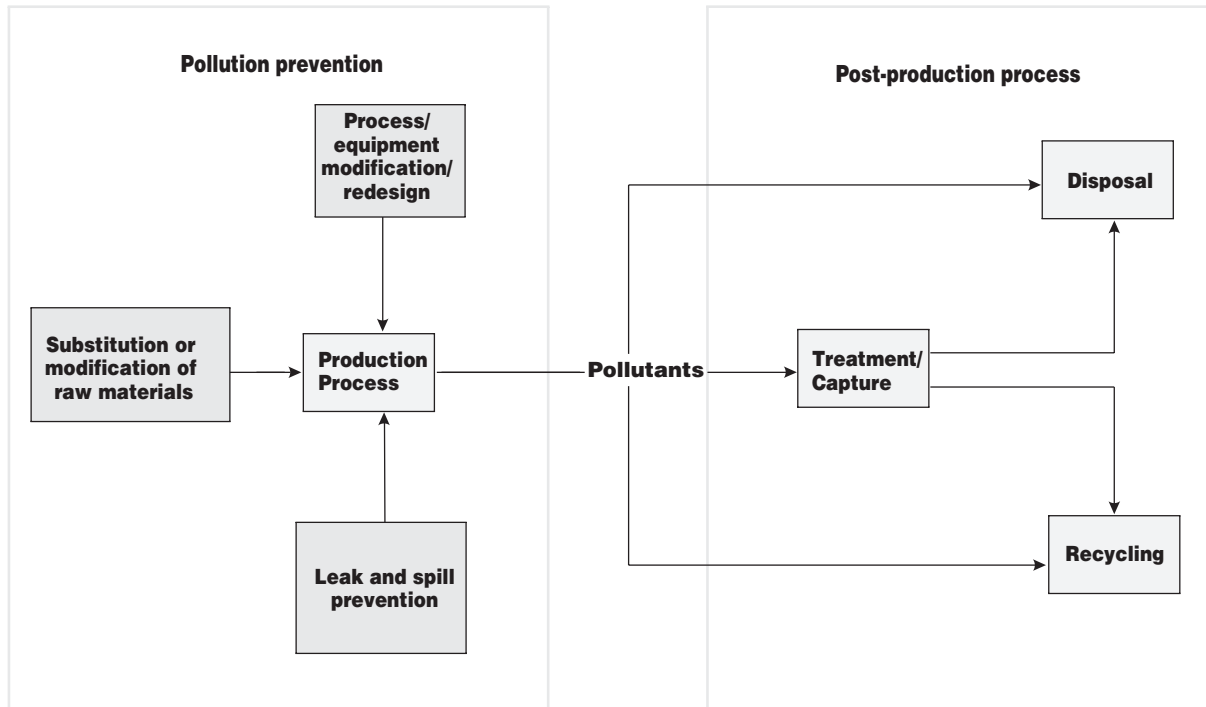
**Pollution prevention activities** are any method, technique, or process that reduces the amount of pollution generated during the production process. Pollution prevention activities can include various equipment and technology modifications; process and procedure modifications; reformulations and redesigns of products (to reduce pollution generated by the manufacturing process); substitutions toward less-polluting raw materials and fuels; and improvements in housekeeping, maintenance, training, and inventory control that result in fewer air emissions, water discharges, or solid waste. The cost of activities involving the redirection of "used" material inputs back into the production process (such as closed-cycle systems) should also be included in pollution prevention if the primary purpose of this activity is pollution abatement rather than to increase profit.

For this survey, pollution prevention activities are grouped into three primary categories:

- **Raw materials substitution or modifications** are activities that alter inputs or allow the use of alternative inputs in order to reduce or modify pollutants during the manufacturing process.
- **Leak and spill prevention** are improvements in housekeeping, maintenance, training, and inventory control that result in fewer accidental releases of polluting raw materials, products, or by-products.
- **Process/equipment modification/redesign** includes equipment and technology modifications, process and procedure modifications, reformulations and product redesigns, and in-process recycling to reduce pollution from the manufacturing process.

As shown in Figure 1, a general distinction between pollution prevention and the other pollution abatement activities is that pollution prevention reduces or eliminates pollutants generated **during** the production process, while treatment/capture, recycling, and disposal are post-production activities used to manage pollutants **after** their generation by the production process.

**Figure 1. Overview of Pollution Abatement Activities**



## GENERAL INSTRUCTIONS

**Complete this form only for your facility.** If your company operates more than one facility, report only for the facility to which this survey was addressed. Do not combine responses with other facilities owned by your company even if operations jointly use the same pollution abatement equipment or staff. Include only corporate expenditures that are billed directly to your facility.

**Report the value of total pollution abatement costs (Items 3B and 4B) even if you are unable to report the values of each separate cost component.**

**Report actual costs whenever possible.** If an actual cost is not available, estimate the cost. Possible sources for your estimate can include accounting records or engineering estimates.

**Example:** If estimated operating costs were provided by a pollution control device vendor as part of an investment proposal, these estimated operating costs could be used to help determine that portion of your facility's operating costs attributable to pollution abatement.

**Example:** If electricity usage for pollution abatement air handling units is not metered separately, use information on the number of motors and total horsepower to estimate that portion of your facility's energy costs attributable to pollution abatement.

**Report only incremental capital expenditures and incremental operating costs associated with pollution abatement activities.** Incremental costs of pollution abatement are the additional costs associated with the *environmental portion* of an investment or of annual operating and maintenance costs. For example, pollution abatement equipment may be integrated into larger investment projects, pollution abatement technologies may be integrated into production equipment, or pollution abatement operating costs may be combined with other costs in a larger cost center. Estimate and report only the portion of capital expenditures and operating costs related to pollution abatement, as illustrated in the examples on pages 8-10 and pages 13-14.

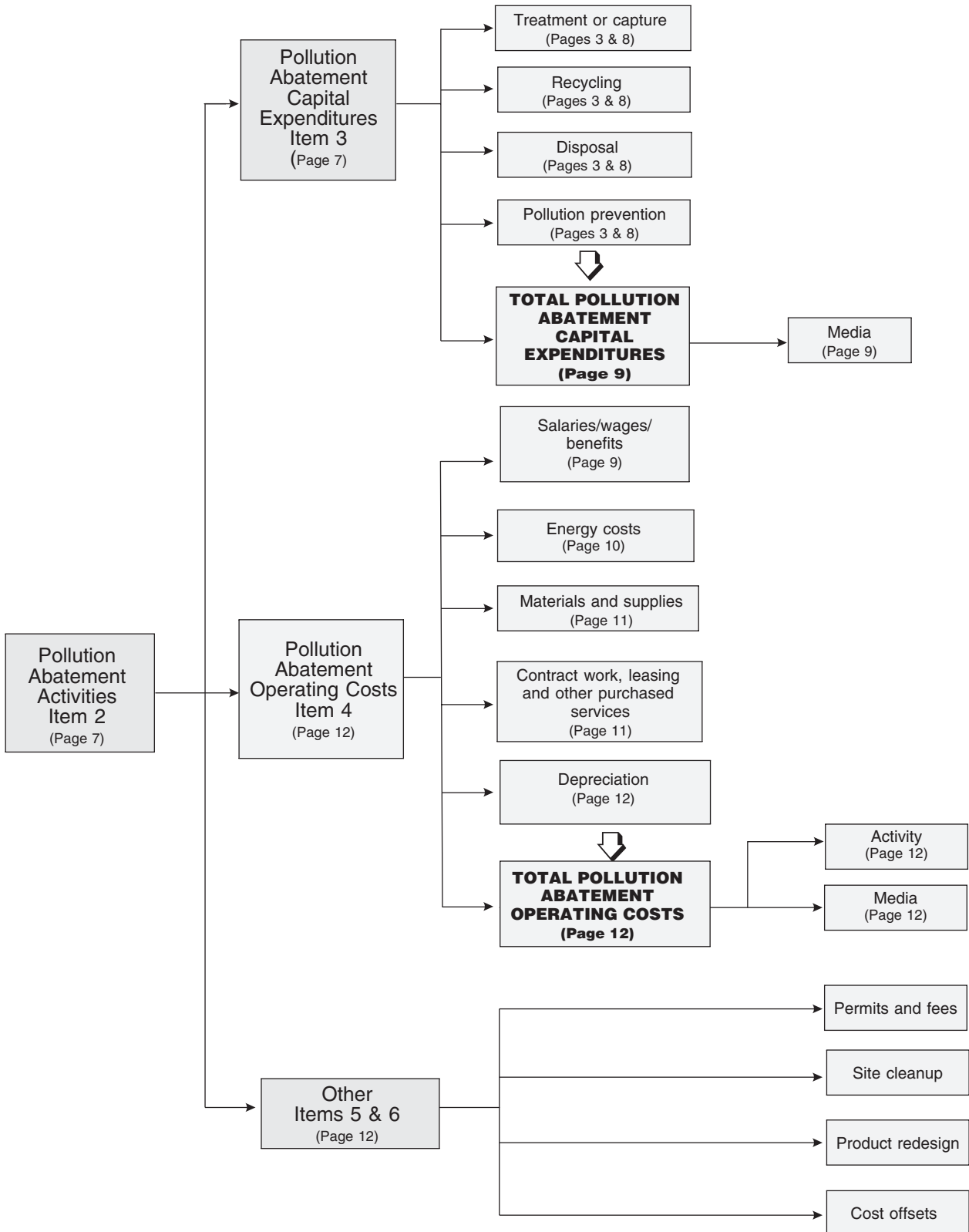
**For this survey, include only those expenditures with the primary purpose of pollution abatement.** Although certain expenditures may have multiple benefits, only consider those expenditures for which pollution abatement is the primary purpose. Investments or activities that increase profits or efficiency in the absence of environmental considerations should not be included, even if pollution abatement occurs as a side benefit. For example, some pollution prevention practices, particularly process modifications, may have been undertaken primarily as a cost-cutting activity. However, if any portion of an investment or activity can be specifically identified as pollution abatement, then those costs *should* be reported in this survey.

**The following are general examples of costs and expenditures to be excluded from this survey:**

- activities that are motivated by profit and whose primary purpose is not pollution abatement;
- costs that did not occur in 2005;
- corporate expenditures for pollution abatement that are NOT directly billed to your facility;
- activities related to health, safety, aesthetics, and employee comfort (OSHA); and
- habitat protection.

**Round all cost estimates to the nearest thousands of dollars.** If expenditures were less than \$500.00 for a specific item, then mark the appropriate box.

**Figure 2. Overview of the Survey Structure**



Note: Page numbers provide links to definitions and examples.

## ITEM BY ITEM INSTRUCTIONS

The PACE survey has eight items. Item 1 asks about your facility. Item 2 asks about your facility's pollution abatement activities. Items 3–6 ask about your facility's pollution abatement costs including capital expenditures, operating costs, costs not included in previous items, and cost offsets. Item 7 asks about the amount of time spent completing this form. Item 8 is the survey certification. Figure 2 provides an overview of the survey's main items.

### Item 1: Facility Information

See the survey form.

### Item 2: Pollution Abatement Activities

**Item 2A** asks about your facility's air pollution control devices in operation in 2005. This item has two columns: (1) one column for the total number of control devices in operation at the beginning of 2005, and (2) one column for the total number of control devices newly installed in 2005. If your facility uses air pollution control devices that are not listed, then write in those devices under "other" and report the number of devices.

**Example:** A facility operates five continuous emissions monitoring systems (CEMS) to measure sulfur dioxide. Four monitors were installed in 1990 and one was installed in 2005. On line 16 (Continuous Emission Monitoring Systems), the facility should report '4' in column (1) and '1' in column (2).

For this item, **Process incinerators/boilers** (line 11) are devices that treat air emissions using a boiler or other combustion device. These devices are primarily installed to provide heat or steam but can also be used as an air pollution control device.

**Example:** A facility routes air emissions generated during the manufacturing process to (1) a coal-fired boiler, that primarily is used to produce heat and steam for the manufacturing process, and (2) a rotary kiln that is used to produce lime. Both the boiler and kiln began operation prior to 2005. On line 11 (Process incinerators/boilers), the facility should report '2' in column (1) and mark the zero box in column (2).

**Item 2B** asks you to report a value for the quantity of wastewater treated on-site and off-site during 2005.

**Example:** A facility generates 10 million gallons of wastewater per day, for a total of 3.65 billion gallons per year. Sixty percent of the wastewater is treated by the facility and is discharged into a nearby river, while the other forty percent is sent to a municipal wastewater treatment plant. The facility should report 2.19 billion gallons per year for "treated on-site" and 1.46 billion gallons per year for "treated off-site".

**Item 2C** asks you to report a value for the quantity of solid waste treated on-site, disposed of on-site, and disposed of off-site during 2005.

**Example:** A facility generates 100,000 tons of solid waste per year: 90,000 tons of wastewater treatment sludge and 10,000 tons of boiler ash. Approximately 50,000 tons of the wastewater treatment sludge is burned in an on-site boiler as fuel. The remaining 40,000 tons is disposed of in an on-site landfill. A contractor is paid to remove the boiler ash and recycles some of it for metals. The facility should report 50,000 tons per year for "treated on-site", 40,000 tons per year for "disposed of on-site", and 10,000 tons per year for "disposed of off-site", even though some of the ash is being recycled.

For this survey, *beneficial reuse* is the reuse of solid material generated by the manufacturing and/or pollution abatement process that would otherwise be considered a solid waste. Co- or by-products *sold* for beneficial reuse should not be included in this item.

**Example:** A facility generates 60,000 tons per year of wastewater treatment sludge that contains some usable raw material. Approximately 3,000 tons of the sludge is recycled and sold for profit; 27,000 tons is disposed of in an on-site landfill; and 30,000 tons is sent to another facility that uses the sludge as a raw material to manufacture a new product. The facility also produces 2 tons per year of hazardous waste that is sent off-site for disposal. The facility should report 27,000 tons per year as "disposed of on-site" (landfilled) and 2 tons per year as being "disposed of off-site". (Neither the 3,000 tons nor the 30,000 tons should be reported in these items because they are disposed of at no cost to the facility.)

### Item 3: Pollution Abatement Capital Expenditures

**Pollution abatement capital expenditures** include any installation or retrofit of structures or equipment that occurred during 2005 with the primary purpose of treating, capturing, recycling, disposing, and preventing pollutants. These expenditures are often referred to as "one-time costs" and include total expenditures for equipment installation and startup.

For this item, report only those pollution abatement capital expenditures made during 2005, not the final equipment value or the total project budget. Report only the incremental costs associated with pollution abatement. (See page 5 for the definition of incremental costs.) If pollution abatement capital expenditures are not budgeted or tracked separately for some projects, *estimate* the portion of total capital expenditures associated with pollution abatement.

**Example (incremental pollution abatement capital expenditures):** A facility operates a rotary material dryer that is equipped with a multiclone and an electrostatic precipitator (ESP) at the dryer exhaust. The multiclone, ESP, and an emissions stack were installed at the same time as part of a dryer system upgrade in 2005. The total capital expenditures for the multiclone/ESP system (including the emissions stack) is \$8 million as follows:

- \$1.8 million for the multiclone
- \$5.2 million for the ESP
- \$1.0 million for the emissions stack

The ESP and stack were installed to comply with state and federal air emissions standards. The ESP reduces particulate emissions that remain in the air stream exiting the multiclone. The primary purpose of the multiclone is to separate the dried material from the air; thus, the multiclone is considered an integral part of the dryer process and is necessary in the absence of environmental regulations. Therefore, the facility should only report the total cost of the ESP and the stack. Since this upgrade is a treatment/capture activity, \$6.2 million should be included in Item 3A1. It should also be included in total pollution abatement capital expenditures (Item 3B) and pollution abatement capital expenditures for air emissions (Item 3C1).

**Item 3A: Activity Categories (Treatment/Capture, Recycling, Disposal, Pollution Prevention)**

The following table provides examples of pollution abatement capital expenditures by activity category. (See page 3 for definitions of these activity categories.) Capital expenditures associated with **testing and monitoring** should be distributed across some or all of the activity categories, as appropriate. Capital expenditures to be excluded are also listed below. Note: Do NOT include capital expenditures related to site cleanup or product redesign/reformulation (these expenditures are to be reported in Item 5). Note also that these lists are intended as examples and are not necessarily exhaustive.

Activity Category	Examples of Pollution Abatement Capital Expenditures	Capital Expenditures to be Excluded
Treatment and capture	Purchase, installation, and startup costs of "end of pipe" pollution abatement equipment, such as baghouses, scrubbers, absorbers, and flares  Oil/water separating systems  Dewatering systems, compactors, and balers	Manufacture of pollution treatment equipment for sale  Equipment installed for the purpose of increasing profits or efficiency  Interest for financing pollution abatement capital expenditures  Improvements for health, safety, aesthetics, or employee comfort (OSHA)  Equipment related to site cleanup [report in Item 5B1]  Facilities or equipment for research and development
Recycling	Water filter systems to recover waste to be reused for its material value  Air handling and injection systems for the capture and use of waste gas with energy value	Capital equipment if your primary product is recycling; that is, you are a recycling plant  Recycling equipment when the primary motivation is profit
Disposal	Purchase of material handling equipment  Construction of on-site landfills  Construction of waste storage facilities or retention ponds	Equipment purchased by an on-site contractor (who manages all solid waste handling at the facility) that is not billed directly to the facility
Pollution prevention	Installation of low NO <sub>x</sub> burners Equipment modifications to burn lowsulfur coal  Closed-cycle water systems Cost of leak prevention and monitoring equipment Storage and delivery systems for environmentally-friendly inputs  The pollution abatement <b>portion of</b> production process enhancements, such as increased energy efficiency or lean manufacturing, intended for environmental protection	Purchase of new equipment that is more energy efficient and thus, theoretically would reduce offsite pollution at the local utility as a result of lower electricity production  Equipment and structures related to product redesign or reformulation intended to reduce the pollution generated by the consumers or users of the facility's products (downstream pollutants), such as reformulated gasoline [report in Item 5C1]



### Item 3B: Total Pollution Abatement Capital Expenditures

See the survey form.

### Item 3C: By Pollution Medium (Air, Water, and Solid Waste)

In **Item 3C**, divide your total pollution abatement capital expenditures into three media types: air emissions, water discharges, and solid waste. (See page 3 for definitions of these pollution media.) For capital expenditures that affect multiple media categories, assign the costs across individual media categories to the best of your ability.

**Example:** During 2005, a facility purchases and installs an electrostatic precipitator (ESP) at a cost of \$6.5 million, replaces a continuous emissions monitor (CEMS) for sulfur dioxide (SO<sub>2</sub>) at a cost of \$125,000, replaces two aerators in its wastewater aeration lagoon at a cost of \$30,000 each, and purchases a new excavator for dredging out an on-site ash pond at a cost of \$220,000. These costs should be categorized as follows:

Equipment	Capital Expenditures	Pollution Abatement Medium
ESP	\$6,500,000	} 96% of costs for air emissions
SO <sub>2</sub> CEMS	\$125,000	
Aerators	\$60,000	1% of costs for water discharges
Excavator	\$220,000	3% of costs for solid waste
TOTAL	\$6,905,000	100%

### Item 3D: Gross Book Value of Pollution Abatement Capital Assets

**Item 3D** asks you to report your facility's gross book value of pollution abatement capital assets as of December 31, 2005. This is the sum of the purchase prices of all pollution abatement equipment installed as of December 31, 2005. For this item, adjust for assets sold, retired, scrapped, and destroyed; however, do not adjust for depreciation charges.

### Item 4: Pollution Abatement Operating Costs

**Pollution abatement operating costs** include all annual costs (such as salaries and benefits, costs of materials and energy, contract work, and the operation, maintenance, and depreciation of capital assets) that occurred during 2005 with the primary purpose of treating, capturing, recycling, disposing, and preventing pollutants.

For this item, report only the incremental costs associated with pollution abatement. (See page 5 for definition of incremental costs.) If pollution abatement operating costs are not budgeted or tracked separately for some categories, *estimate* the portion of total costs associated with pollution abatement.

**Example (incremental pollution abatement operating costs):** A facility's manufacturing process requires \$100,000 per year in labor costs and \$10,000 in solvents (materials). However, because of environmental regulations (or other environmental concerns), labor costs increase to \$125,000 per year and material costs increase to \$15,000 because of a switch from oil-based to water-based solvents. As a result, the facility should report the following incremental pollution abatement operating costs:

- \$25,000 – Salaries, wages, and benefits (Item 4A1)
- \$5,000 – Materials and supplies (Item 4A3)
- \$30,000 – Total pollution abatement operating costs (Item 4B).

Do NOT include, in any of these categories, costs associated with site cleanup or product redesign/reformulation. Also, do NOT include the cost of permits and fees. These costs are to be reported in Item 5 of the survey.

### Item 4A: Cost Categories (Labor, Energy, Materials, Contract Work, Depreciation)

In **Item 4A**, total pollution abatement operating costs are divided into five cost categories: salaries, wages, and benefits; energy costs; materials and supplies; contract work, leasing, and other purchased services; and depreciation.

**Salaries, wages, and benefits** include staff time associated with pollution abatement activities. Report the salaries and wages you use for calculating the withholding tax, plus benefits. Salaries, wages, and benefits to be included and excluded in Item 4A1 are listed below. Note that these lists are intended as examples and are not necessarily exhaustive.

<p><i>Include salaries, wages, and benefits for</i></p> <ul style="list-style-type: none"> <li>• The share of time environmental managers and engineers spend on pollution abatement activities</li> <li>• The share of time production and maintenance staff spend on pollution abatement activities, including the operation and maintenance of pollution abatement equipment</li> <li>• Staff time spent performing on-site disposal and recycling</li> <li>• Staff time spent on leak detection programs</li> <li>• Staff time for permit preparation and meetings with environmental regulators</li> <li>• Staff time for environmental auditing and plant certification (such as ISO 14000)</li> <li>• Staff time spent on completing environmental reporting requirements</li> <li>• Staff time spent conducting environmental studies for development or expansion</li> </ul>	<p><i>Exclude salaries, wages, and benefits for</i></p> <ul style="list-style-type: none"> <li>• Environmental staff at corporate headquarters. If billed directly to your facility, report those costs in Item 4A4 (contract work).</li> <li>• Research and development activities</li> </ul>
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**Example (salaries, wages, and benefits):** During 2005, a facility employs 3 full-time staff and 1 wastewater treatment operator in its environmental department. (The facility's solid waste management activities, including an on-site landfill, are managed by a contractor.) The facility also employs 1 lab technician who is responsible for performing sampling and testing of wastewater and sludge, which requires about 2 hours of labor each day. The facility also operates 5 air pollution control devices, each of which requires about 10 hours of labor each week to operate and maintain (by production staff). The annual salary for each of the 3 full-time staff and 1 wastewater treatment operator is \$80,000. The lab technician's wage is \$30 per hour, and the production workers' wages average about \$20 per hour. All salaries are multiplied by 35 percent to account for benefits. Therefore, the total salaries, wages, and benefits for pollution abatement are estimated to be:

Environmental department staff:  $4 \times (\$80,000/\text{year}) \times 1.35 = \$432,000$  per year  
 Lab technician wages:  $(2 \text{ hours/day}) \times (365 \text{ days/year}) \times (\$30/\text{hour}) \times 1.35 = \$29,565$  per year  
 Operator wages:  $(10 \text{ hours/week}) \times (5 \text{ devices}) \times (52 \text{ weeks/year}) \times (\$20/\text{hour}) \times 1.35 = \$70,200$  per year  
**TOTAL: \$532,000** per year (rounded to nearest thousand)

**Energy costs** include electricity, fuels (oil, natural gas, coal), and other energy costs. This includes both fuel and power for operating pollution abatement equipment as well as the incremental costs associated with the purchase of environmentally-friendly fuels. (See page 5 for definition of incremental costs.) If pollution abatement energy costs are not metered or tracked separately from facility-wide energy costs, *estimate* the portion of total energy costs associated with pollution abatement. Energy costs to be included and excluded in Item 4A2 are provided below. Note that these lists are intended as examples and are not necessarily exhaustive.

<p><i>Include energy costs for</i></p> <ul style="list-style-type: none"> <li>• Electricity for operating pollution abatement equipment, such as baghouses, scrubbers, ESPs, wastewater treatment pumps and aerators, etc.</li> <li>• Fuel costs for thermal oxidizers installed for air pollution control</li> <li>• Electricity generated on-site that is used by pollution abatement equipment</li> <li>• Difference in costs (incremental costs) resulting from the use of a more environmentally-friendly fuel (such as low-sulfur coal)</li> </ul>	<p><i>Exclude energy costs for</i></p> <ul style="list-style-type: none"> <li>• Fuel costs for boilers that operate primarily to provide steam/heat/electricity for the production process, but are also used to incinerate air emissions</li> <li>• Electricity costs associated with production equipment</li> </ul>
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**Example (incremental fuel costs):** A facility purchases 1,000 tons of coal per year. To lower its emissions it purchases low-sulfur coal at \$30 per ton instead of higher sulfur coal available at \$20 per ton. The pollution abatement energy costs associated with the purchase of the low-sulfur coal are:

$$(1,000 \text{ tons/year}) \times (\$10 \text{ incremental cost/ton}) = \mathbf{\$10,000}$$
 per year

**Example (estimating energy costs):** A facility does not track pollution abatement electricity costs separately from total facility-wide electricity costs. Therefore, the facility must estimate electricity costs for pollution abatement. Based on information found in equipment manuals, the facility knows that the total horsepower (hp) requirement for the wastewater

treatment system pump is 760 hp. The on-site wastewater treatment facility also includes 25 aerators, each rated at 75 hp, for a total of 1,875 hp. The air pollution control devices and associated fans and pumps have a total horsepower requirement of 1,475 hp. The facility operates 365 days per year, 24 hours per day, and pays an average industrial electricity rate of \$38.77 per megawatt-hour (MWh). (Note: 1 MW = 1,341 hp.) The facility also operates a thermal oxidizer that uses 100 million cubic feet (ft<sup>3</sup>) of natural gas per year at a cost of \$6.41 per 1,000 ft<sup>3</sup>. Therefore, the total energy costs for pollution abatement are estimated as follows:

Total electricity usage for pollution abatement = 760 + 1,875 + 1,475 = 4,110 hp

Total electricity usage in MWh per year = (4,110 hp) x (365 days/year) x (24 hours/day) x (1 MW / 1,341 hp) = 26,848 MWh per year (rounded)

Total electricity cost for pollution abatement = (26,848 MWh/year) x (\$38.77/MWh) = \$1,041,000 per year (rounded)

Total fuel (natural gas) cost for pollution abatement = (100,000,000 ft<sup>3</sup>) x (\$6.41/1,000 ft<sup>3</sup>) = \$641,000 per year

Total energy costs for pollution abatement = \$1,041,000 + \$641,000 = **\$1,682,000**

**Note:** If you do not have horsepower information with which to derive pollution abatement electricity costs, *estimate* the portion of your facility's total electricity costs associated with pollution abatement. If your electricity is generated on-site, *estimate* the portion of this self-generated electricity used by pollution abatement equipment and value this electricity at the appropriate or average market price of electricity in your region.

**Materials and supplies** include the delivered cost of materials, parts, and components used as operating supplies for pollution abatement or in the repair and maintenance of pollution abatement capital assets. In addition, this includes the incremental costs associated with the purchase of environmentally-friendly materials and supplies. (See page 5 for definition of incremental costs.) Materials and supplies to be included and excluded in Item 4A3 are provided below. Note that these lists are intended as examples and are not necessarily exhaustive.

<i>Include material and supply costs for</i>	<i>Exclude material and supply costs for</i>
<ul style="list-style-type: none"> <li>• Parts for pollution abatement equipment maintenance and repair</li> <li>• Wastewater treatment chemicals</li> <li>• Caustic used in wet scrubbers</li> <li>• Laboratory chemicals and supplies used for sampling and testing for environmental compliance</li> <li>• Difference in costs (incremental costs) resulting from the use of a more environmentally-friendly raw material (such as a switch from oil-based to water-based solvents)</li> </ul>	<ul style="list-style-type: none"> <li>• Laboratory chemicals used for testing products in various stages of the manufacturing process</li> <li>• Use of a new raw material that reduces pollution but is <i>less</i> expensive than the raw material it replaces</li> </ul>

**Contract work, leasing, and other purchased services** include payments made to private and public service providers for both on-site and off-site pollution abatement activities, as well as leasing costs for capital equipment associated with pollution abatement. Also include pollution abatement expenditures by your corporate headquarters on behalf of your facility, but only *if* those expenditures are billed directly to your facility. Costs to be included and excluded in Item 4A4 are provided below. Note that these lists are intended as examples and are not necessarily exhaustive.

<i>Include contract and purchased service costs for</i>	<i>Exclude contract and purchased service costs for</i>
<ul style="list-style-type: none"> <li>• Collection and disposal of waste created by the production process, by a private contractor</li> <li>• Sewage and solid/contained waste collection and disposal paid to federal, state, or local governments</li> <li>• Management of an on-site (industrial) landfill, by a private contractor</li> <li>• Pollution abatement activities performed by your corporate headquarters that WERE billed directly to your facility</li> <li>• All costs that would be included in Item 4A1 if the activity were done by your own staff</li> <li>• Air emissions and water discharge testing services</li> <li>• Off-site laboratory analysis of water samples</li> <li>• Leasing of capital equipment used for pollution abatement purposes</li> </ul>	<ul style="list-style-type: none"> <li>• Collection and disposal of office and cafeteria waste (If you cannot separate from costs for industrial waste, report the entire amount)</li> <li>• Sanitary sewage (If you cannot separate from costs for industrial wastewater, report the entire amount)</li> <li>• Research and development services</li> <li>• Pollution abatement activities performed by your corporate headquarters that WERE NOT billed directly to your facility</li> <li>• Environmental permits, fees, fines, penalties, taxes, and contributions</li> <li>• Legal fees</li> </ul>

**Depreciation** is related to capital expenditures (in Item 3) but is reported in this section of the survey. In Item 4A5, report year-end accumulated depreciation and amortization charges for depreciable assets used in pollution abatement activity. Include charges against depreciable pollution abatement equipment acquired during the year as well as any charges against pollution abatement equipment sold or retired during the year. Depreciation and amortization charged during the year is attributed to the wear and tear on equipment and structures as well as obsolescence due to changing technology. At the end of the expected life of an asset, the entire cost of the asset will have been depreciated.

#### **Item 4B: Total Pollution Abatement Operating Costs**

See the survey form.

#### **Item 4C: By Activity Categories (Treatment/Capture, Recycling, Disposal, Pollution Prevention)**

In **Item 4C**, divide your total pollution abatement operating costs into the four major activity categories: treatment/capture, recycling, disposal, and pollution prevention. (See page 3 for definitions of these activity categories as well as the examples in Item 3A on page 8.) Operating costs associated with **testing and monitoring** should be distributed across some or all of the activity categories, as appropriate. Do NOT include the costs of permits and fees or the operating costs associated with site cleanup and product redesign/reformulation (these costs are to be reported in Item 5).

#### **Item 4D: By Pollution Medium (Air, Water, and Solid Waste)**

In **Item 4D**, divide your total pollution abatement operating costs into three media types: air emissions, water discharges, and solid waste. (See page 3 for definitions of these pollution media.) For operating costs that affect multiple media categories, assign the costs across individual media categories to the best of your ability.

#### **Item 5: Costs Not Included in Previous Items**

In **Item 5A, permits and fees** include payments to local, state, and federal government agencies for permits and fees associated with pollution from your production process (e.g., Title V permit fees; emission fees). For this item, do NOT include the cost of tradable permits or emission credits. Also, do NOT include fines, penalties, or contributions. Do NOT include the labor costs or contract work associated with permit preparation; these costs should be reported in Item 4. (See example on page 14.)

In **Item 5B, site cleanup** includes expenditures and costs related to the remediation of contamination due to leaks, spills, waste disposal, or other releases from current or past production activities. Also include the costs of site assessment, sampling, and analyses associated with the site cleanup. The pollution must be on the site of the designated facility located at the address printed on the front of the survey form. (See example on page 14.)

In **Item 5C, product redesign** includes expenditures and costs of product reformulation intended to reduce the pollution generated by consumers or users of this facility's products. This is also referred to as downstream pollutants. Examples of product redesign include reformulated gasoline and the reformulation of paint from oil-based to latex. In both cases, emission reductions occur at the point where the product is used, not at the facility where it is produced. Costs associated with the redesign and reformulation of products to reduce pollution *at the manufacturing facility* should NOT be included here; these costs should be reported under pollution prevention in Items 3 and 4 above. (See examples on page 14.)

#### **Item 6: Cost Offsets**

**Cost offsets** are related to operating costs (in Item 4) but are reported in this section of the survey. Cost offsets are operating expenses recovered as a result of pollution abatement activities. Cost offsets are usually the value of recovered/recycled materials or recovered energy. Cost reductions from such waste minimization/recycling and energy recovery should be reported here, but only if these activities were motivated by pollution abatement and NOT by production efficiency or profit. That is, revenues from recycling and cost savings from reduced material or fuel purchases should NOT be included if these activities are profitable in the absence of environmental concerns. (See examples on page 14.)

#### **Item 7: Burden**

See the survey form.

#### **Item 8: Certification**

See the survey form.

## ADDITIONAL EXAMPLES

This section provides additional examples of pollution abatement activities and projects and indicates how they relate to the items and definitions in this survey.

### Treatment/Capture

- A facility installs an electrostatic precipitator (ESP) to reduce particulate matter (PM) emissions from one of its production units. The facility also installs a continuous opacity monitoring system (COMS) at the outlet of the ESP to monitor opacity (as a surrogate for PM emissions). The total capital expenditure on the ESP (including installation, fans, and ductwork, for example) and the COMS should be included in the **pollution abatement capital expenditures** for treatment/capture. The costs associated with operating the ESP and the COMS (e.g., electricity costs to run the ESP and COMS and labor involved in collecting and reporting COMS data) should be included in the **pollution abatement operating costs (labor, energy, materials, contract work, depreciation)** for treatment/capture.
- A facility installs a new flotation clarifier as part of its on-site wastewater treatment unit. All capital expenditures associated with the purchase, installation, and start-up of the new clarifier should be included in the **pollution abatement capital expenditures** for treatment/capture. All costs associated with operating the new clarifier (e.g., cost of electricity to run the compressor, cost of flocculating chemicals) plus the costs for operating the other wastewater treatment equipment should be included in the **pollution abatement operating costs (labor, energy, materials, contract work, depreciation)** for treatment/capture.
- A facility hires an environmental consulting company to conduct an emission source test to measure air pollutant emissions from the facility's control device. The contractor costs associated with conducting this source test should be included in **pollution abatement operating costs (contract work)**. The labor costs for facility personnel to supervise and assist in conducting this source test should be included in **pollution abatement operating costs (salaries, wages, and benefits)**.

### Recycling

- A facility installs and operates equipment used to recycle its waste streams in order to comply with environmental regulations or for other environmental reasons. Costs associated with installing this equipment (e.g., purchased equipment, required engineering, site preparation, installation, and other associated costs) should be included in **pollution abatement capital expenditures** for recycling. All costs associated with operating and maintaining the equipment should be included in **pollution abatement operating costs (labor, energy, materials, contract work, depreciation)** for recycling.

### Disposal

- A facility constructs a new on-site landfill for the disposal of its solid waste. All costs associated with constructing the landfill (including the equipment and machinery necessary for managing the landfill) should be included in **pollution abatement capital expenditures** for disposal.
- A facility generates solid waste from several sources, including sludge from an on-site wastewater treatment operation and scrap metal generated during the manufacturing process. All of the solid waste is sent to an on-site landfill that is operated by a contractor. The payments to the contractor should be included in **pollution abatement operating costs (contract work)** for disposal.
- A facility hires an outside contractor to periodically pick up spent process catalyst for disposal. Contract fees for this disposal should be included in **pollution abatement operating costs (contract work)** for disposal.
- A facility pays its local government to accept its industrial wastewater at a public water treatment facility. These payments should be included in **pollution abatement operating costs (contract work)** for disposal.

### Pollution Prevention

- A facility switches to a new, more expensive raw material that either contains fewer pollutants or releases fewer pollutants when used in the production process. To accommodate the use of this new raw material, the facility must make some slight modifications to its production process and manufacturing equipment. The costs associated with the equipment modifications should be included in **pollution abatement capital expenditures** for pollution prevention. The incremental cost (i.e., the cost difference) associated with using the new raw material versus the conventional/standard raw material should be included in **pollution abatement operating cost (materials and supplies)** for pollution prevention.
- A facility implements a new leak detection and repair (LDAR) program to reduce equipment leaks. The cost of the equipment associated with the LDAR program (e.g., pump seals, monitoring equipment, such as handheld organic vapor detectors) should be included in **pollution abatement capital expenditures** for pollution prevention. The costs associated with running the LDAR program (e.g., staff to monitor for leaks and prepare periodic reports) should be included in **pollution abatement operating costs (labor, energy, materials, contract work, depreciation)** for pollution prevention.

- A facility installs a new technology with the primary purpose of reducing the amount of air pollutants released per ton of product manufactured. The new technology requires more electricity and more staff time than the conventional technology. The costs associated with purchasing and installing the new technology should be included in **pollution abatement capital expenditures** for pollution prevention. Only the *additional* energy and labor costs (i.e., the incremental costs) of operating this new technology relative to the conventional technology should be included in **pollution abatement operating costs (labor, energy)** for pollution prevention.

## Costs Not Included in Previous Items

### Permits and Fees

- A facility undertakes a major expansion that triggers new environmental requirements. The fees associated with obtaining or updating its environmental permits from the state or federal government should be reported in **permits and fees**. The staff time spent on this permitting process should be reported in **pollution abatement operating costs (salaries, wages, and benefits)**, while any fees paid to consultants on this activity should be included in **pollution abatement operating costs (contract work, leasing, and other purchase services)**.

### Site Cleanup

- A facility treats its contaminated soil via soil vapor extraction. For this purpose, it purchases a vacuum system and carbon treatment unit. The cost of this equipment should be included in **site cleanup capital expenditures**. The costs of operating this equipment, and the labor and materials necessary to conduct any testing and monitoring activities should be included in **site cleanup operating costs**.
- A facility hires a contractor to remove contaminated soil. The payments made to the contractor should be included in **site cleanup operating costs**.

### Product Redesign

- A petroleum refinery changes its production process to allow it to produce low-sulfur diesel and gasoline fuels, which decrease the pollution emitted by motor vehicles. This change to the production process has no effect on the amount of pollution generated by the facility and therefore it is not considered a pollution abatement activity for the purposes of this survey. Instead, the facility's costs associated with this change should be reported in **product redesign capital expenditures** and **product redesign operating costs**.
- A manufacturer of surface coatings reformulates its coating products to reduce the amount of hazardous air pollutants (HAPs) they contain in order to help its customers comply with certain federal environmental regulations. While these new low-HAP coatings will reduce the air emissions in its customers' surface-coating operations, this product reformulation has no effect on the air emissions from its own facility and therefore is not considered a pollution abatement activity for the purposes of this survey. Instead, the facility's costs associated with this product reformulation should be reported in **product redesign capital expenditures** and **product redesign operating costs**.

### Cost Offsets

- As an alternative to disposing used oil, a manufacturing plant has its used machinery oil picked up by a hazardous waste collection and treatment service. This service provider charges a fee. This fee should be reported in **pollution abatement operating costs (contract work)** for disposal (Item 4A4). The service provider returns the oil fully cleaned. Thus, the plant avoids having to buy new machinery oil. The value of the returned oil should be reported in **cost offsets**.
- A manufacturer purchases a cardboard baler to recycle cardboard containers associated with the manufacturing process. The capital expenditure should be reported in **pollution abatement capital expenditures** for recycling (Item 3A2). The costs associated with operating and maintaining the baler should be reported in **pollution abatement operating costs (labor, energy, materials, contract work, depreciation)** for recycling (Item 4). The manufacturer sells the cardboard to a recycler. The activity is not a potentially profit-making venture; it is conducted for pollution abatement. The revenues received from the recycler should be reported in **cost offsets**.
- A manufacturer installs a closed-cycle water recovery system in the production process to prevent the dumping of chemicals into the water system. Because the closed-cycle recovery system recaptures and reuses the chemicals in the production process, it reduces the expenses for these chemicals. The pollution abatement portion of the capital expenditure related to the closed-cycle recovery system should be reported in **pollution abatement capital expenditures** for pollution prevention (Item 3A4). The costs associated with operating and maintaining the system should be reported in **pollution abatement operating costs (labor, energy, materials, contract work, depreciation)** for pollution prevention (Item 4). The value of the recovered chemicals should be reported in **cost offsets**.