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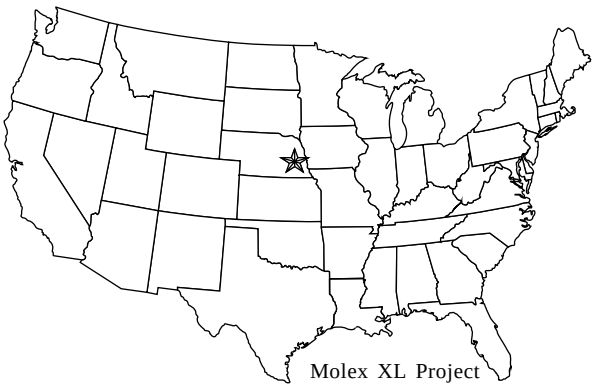
Project XL Progress Report
Molex Incorporated

On March 16, 1995, the Clinton Administration announced a portfolio of reinvention initiatives to be implemented by the U.S. Environmental Protection Agency (EPA) as a part of its efforts to achieve greater public health and environmental protection at a more reasonable cost. Through Project XL, which stands for eXcellence and Leadership, EPA enters into specific project agreements with public or private sector sponsors to test regulatory, policy, and procedural alternatives that will produce data and experiences to help the Agency make improvements in the current system of environmental protection. The goal of Project XL is to implement 50 projects that will test ways of producing superior environmental performance with improved economic efficiencies, while increasing public participation through active stakeholder processes. As of October 1999, 15 XL projects are in the implementation phase and 35 XL projects are under development. EPA Project XL Progress Reports provide overviews of the status of XL projects that are implementing Final Project Agreements (FPAs). The progress reports are available on the Internet via EPA's Project XL web site at http://www.epa.gov/Project XL. Or, hard copies may be obtained by contacting the Office of Reinvention's Project XL general information number at (202) 260-7434. Additional information on Project XL is available on the web site or by contacting the general information number.

Background

Molex Incorporated (Molex) is a multinational company that operates 47 facilities worldwide, in manufacturing, electroplating, metal stamping, and plastic molding. Its products include fiber optics. Molex electroplates coatings of nickel, copper, and tin and lead metals on substrate materials for a variety of manufacturing purposes. The process generates large volumes of wastewater containing metal contaminants, which are subsequently captured in wastewater treatment systems and become a Resource Conservation and Recovery Act (RCRA) hazardous waste. Molex previously operated a wastewater treatment system that combined the wastewater streams from nickel, copper, and tin and lead plating processes.



Molex XL Project
Lincoln, Nebraska

Major Milestones

July 11, 1995
Molex XL Proposal Submitted

August 7, 1998
Nebraska DEQ Temporary Variance Issued

August 11, 1998
Final Project Agreement Signed

August 7, 2000
Expiration of Nebraska DEQ Temporary Variance

These waste streams were treated in a single wastewater treatment process that generated a hazardous multiple-metal waste material from which only one of the metals could be recovered, with the rest disposed. Molex switched to a process that segregates the wastewater streams from the plant's multiple electroplating processes and treats each one separately. Therefore, Molex recovers metal contaminants separately, reduces the amount of metal that would otherwise be disposed of in RCRA-regulated landfills or released to the environment at secondary smelters, and reduces metal-contaminant levels in the effluents discharged from the facility's wastewater treatment systems to Lincoln's publicly owned treatment works (POTW). In its XL proposal, Molex requested a variance from hazardous waste regulations in order to reduce the costs of storing and shipping these wastes to make it more economical to recover metals from electroplating waste streams.

Molex believes that its new segregated wastewater treatment system results in superior environmental performance through a reduction in the amount of metals discharged to Lincoln's POTW, as well as through an increase in metals recycling. Operational process lines were changed to generate separate treatment sludges for nickel, copper, and tin/lead that are classified as hazardous waste under the Nebraska Department of Environmental Quality (NDEQ) Hazardous Waste Management Program. Through these operational process changes, the Molex XL project seeks to provide superior environmental performance by

- reducing the amount of metals loading in the effluent discharged to Lincoln's POTW,
- increasing the level of metals reclamation or recycling, and
- reducing the amount of material that would otherwise require landfill disposal.

The segregated treatment system, however, costs more to operate than a combined treatment system. Additionally, the segregated system results in increased costs from compliance with current regulations for handling the resultant sludges. By providing the facility with a temporary variance from classifying nickel, copper, and tin/lead sludges as a solid waste, the Molex XL project is helping to financially justify the continued operation of the segregated system. This temporary variance, which was issued by NDEQ on August 7, 1998, allows Molex to handle the storage and shipment of these non-precious mono-metals sludges at substantially reduced costs for 2 years. The variance expires on August 7, 2000.

Molex estimates that the recovery of non-precious metals under the former combined processing system cost approximately $14,500 annually. Under the new system, Molex anticipates receiving an annual income of more than $7,600 from the sale of the separated, non-precious metals-bearing sludges, and benefiting from a net annual savings in waste management costs of more than $22,000.

The Experiment

The Molex project tests whether regulatory flexibility through a variance from hazardous waste regulations will lead to a reduction in the costs of storing and shipping these wastes, and an increase in the rate of metals recovery from the multiple waste streams the project generates.

The Flexibility

As an incentive to achieve superior environmental performance at Molex's Lincoln facility, EPA and the NDEQ are providing more flexible and cost-effective processes for regulatory management. The statutory programs, and the EPA offices administering the programs, affecting the Molex XL project are

- Resource Conservation and Recovery Act (RCRA) programs administered by EPA's Office of Solid Waste;
- Pollution Prevention Act (PPA) programs administered by EPA's Office of Prevention, Pesticides, and Toxic Substances; and
- Federal Water Pollution Control Act (FWPCA) programs administered by EPA's Office of Wastewater Management.

EPA, pursuant to RCRA Section 3005(b), has authorized NDEQ to carry out Nebraska's Hazardous Waste Management Program in lieu of the Federal program. Under this authority, NDEQ issued a variance to Molex granting the facility a temporary exemption from the classification as hazardous waste of segregated sludges generated during wastewater treatment. Without this variance, the sludge materials would be subject to NDEQ generator requirements for storage and shipment of hazardous wastes.

Sludges from the former combined treatment system at Molex's Lincoln facility contained copper, nickel, tin, lead, and gold. The sludges' gold content allowed Molex to handle the combined treatment sludge as recyclable materials from which precious metals are reclaimed, under Title 128, Rules and Regulations Governing Hazardous Waste Management in Nebraska, Chapter 7, Section 010. Sludges generated at the upgraded facility, however, do not contain precious metals and no longer qualify under the recyclable precious metal exclusion.

By obtaining approval from the NDEQ under RCRA to classify its segregated process sludge as a "partially reclaimed" material rather than as a hazardous waste, Molex can ship the sludges using common carriers, rather than hazardous waste carriers that are subject to additional regulations for transportation, storage, and disposal (TSD) facilities under RCRA. Additionally, Molex is permitted to ship the hazardous materials on an as-needed basis, rather than every 90 days as required for hazardous waste.

The temporary variance from NDEQ, which will remain in effect for 2 years and will expire August 7, 2000, allows Molex sufficient time to demonstrate that segregation and separate treatment of various waste streams results in a significantly reduced metals content in the wastewater effluent. Data gathered will also be used to demonstrate whether the segregated system produces a recyclable sludge with market value. Ultimately, information gained through the sampling program may result in modified national or state performance standards.

This XL project supports RCRA, PPA, and Nebraska Hazardous Waste Management Program's goals of resource recovery and conservation. Specifically, the project results in recycling of mono-metal sludges by recycling facilities, which will decrease the need for mining of ores or other virgin materials. This will result in the conservation of mineral resources and a reduction in the amount of materials that would otherwise be sent to a landfill.

The Molex XL project also supports the goals of the FWPCA and Nebraska Surface Water Quality Standards to restore and maintain the chemical, physical, and biological integrity of the nation's and state's waters. Specifically, the project reduces the amount of metals being loaded into the City of Lincoln's POTW, thus reducing metals discharged from the POTW into surface waters and the amount of metals-bearing sludges that are ultimately sent to a landfill. Additionally, the reduced loading gives the POTW a reserve treatment capacity, reducing the need to replace or enlarge the publicly financed facility.

Promoting Innovation and System Change

Project XL provides EPA opportunities to test and implement approaches that protect the environment and advance collaboration with stakeholders. EPA is continually identifying specific ways in which XL projects are helping to promote innovation and system change. The innovations and system changes emerging from the Molex XL project are described below.

Using a RCRA Solid Waste Variance to Encourage Recycling. Under the RCRA regulations, regulated entities may petition EPA to exempt or exclude materials from classification as a solid or hazardous waste. Molex is testing the use of a solid waste variance for RCRA-listed wastes to encourage metals recycling and reduce solid waste generation. The environmental performance and economic feasibility of the Molex project could serve as a benchmark against which other potential requests for temporary variances may be measured.

Project Commitment Summary

This table and the environmental performance section that follows summarize progress in meeting the commitments described in the FPA and temporary variance for the Molex Facility in Lincoln, Nebraska.

Commitment	Status
Waste Analysis and Reporting	
Conduct and submit results of initial waste analysis on each of the three sludges (nickel, copper, and tin/lead) for toxicity characteristic leaching procedure (TCLP), toxic metals, pH, and moisture content, in accordance with the variance and Attachment B of the FPA.	Analytical results were included in the initial baseline report, which was submitted to NDEQ and EPA on November 17, 1998.
Conduct and submit results of waste analysis on each of the three sludges for chlorine, sulfides, antimony, beryllium, thallium, heating value, and total organic carbon (TOC), in accordance with the FPA.	Analytical results (with the exception of TOC) were submitted to EPA on September 15, 1998.
If waste analysis indicates that TOC exceeds 500 parts per million (ppm) (by weight), submit data that prove that samples do not include greater than a 500 ppm total concentration of organic compounds, in accordance with the FPA.	Analytical results on TOC were included in the first quarterly report, which was submitted to NDEQ and EPA on December 4, 1999.
Conduct waste analyses on each sludge shipment prior to reclamation of total copper, nickel, lead, tin, zinc; of pH; and of moisture content, in accordance with the variance and FPA.	Commencing in 1999, waste analyses will be conducted prior to each shipment.
Provide an initial Baseline Report describing (1) the performance of the combined treatment system for the most recent 12-month period prior to implementation of the segregated treatment system, and (2) productivity estimates of the segregated treatment system, in accordance with the variance and FPA.	The initial Baseline Report was submitted to NDEQ and EPA on November 17, 1998.
Submit quarterly reports to EPA and NDEQ every 3 months after submitting the initial baseline report describing current data for the segregated treatment system, in accordance with the variance and FPA.	First quarterly report: December 4, 1998 Second quarterly report: March 4, 1999 Third quarterly report: May 27, 1999 Fourth quarterly report: August 7, 1999
Provide a final report in accordance with the terms outlined in the variance and FPA.	The final report is due December 15, 2000.
Maintain records of test results, waste analyses, and other variance conditions.	During 1998, Molex began implementing a records management system supporting terms of the variance.
Notify the NDEQ of the name, address, and facility contact for each facility to which material is sent for reclamation, and a description of anticipated processing.	In 1999, Molex began to notify NDEQ of each facility that receives material for reclamation.

Commitment	Status
Waste Recordkeeping, Storage, and Transfer	
Maintain nonhazardous waste manifests identifying each specific shipment.	Beginning in 1999, Molex began to maintain nonhazardous waste manifests for each shipment.
Accumulate the nickel and copper sludges for no longer than 180 days before shipment, and store and transfer the tin/lead sludge in accordance with variance provisions.	Storage conditions specified in the variance are being met by Molex, with shipment of the segregated sludges to begin in 1999.
EPA Commitments	
Determine need for additional sampling.	After the submittal of the fourth quarterly report, EPA will determine whether additional sampling and analysis will be necessary for the duration of the temporary variance.

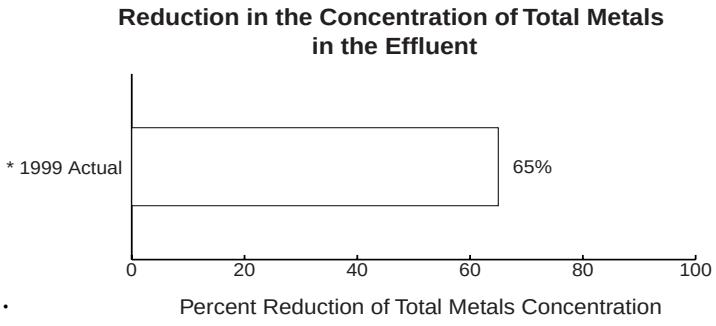
Environmental Performance

This section summarizes progress in meeting the environmental performance described in the FPA and temporary variance for the Molex Facility in Lincoln, Nebraska.

Note about the Baseline Data: In its Baseline Report Molex (1) collected data on the combined treatment system for the most recent 12-month period prior to implementation of the segregated treatment system, and (2) provided productivity estimates of the segregated treatment system. For the combined treatment system, the report presented data on the concentration and mass of metals in the effluent discharged to Lincoln's POTW, the volume of sludges generated and stored on site, the volume of sludges shipped to the recycler, and an analysis of the sludges. The report also estimated the productivity of the segregated treatment system. It is important to note that sludge volumes between the combined treatment process and the segregated treatment process are not strictly comparable, because the combined treatment sludges were dried, but the segregated treatment sludges were not. This section compares the estimated sludge generation rates from the Baseline Report, and actual sludge generation rates of the segregated treatment system.

Total Generation of Sludge

In the Baseline Report, Molex estimated that the segregated treatment system would generate a total of 71,328 pounds of sludge, but actual generation rates based on the Quarterly Reports indicate that actual sludge generation rates were 10.3% higher (78,709 pounds) than the estimated baseline for the segregated system . Based on the Quarterly Reports, it is estimated that the segregated treatment system has resulted in a 65% reduction in the concentration of total metals in the effluent discharged by the POTW.

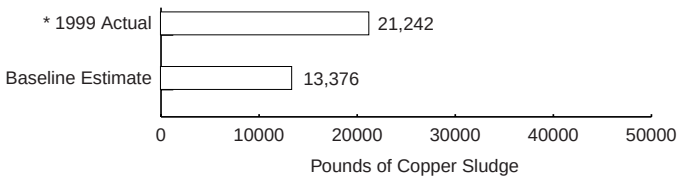


* This information is based on Molex's quarterly reports, which cover project performance from 8/7/98-8/7/99

Copper Sludge Generation and Loading

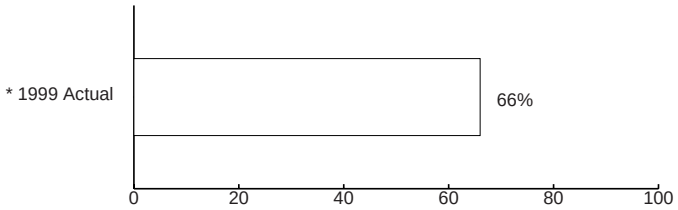
In the Baseline Report, Molex estimated that 13,376 pounds of copper sludge would be generated with the segregated treatment system. However, actual generation rates were 59% higher (21,242 pounds) than the estimated baseline. Based on the Quarterly Reports, and since this sludge is recycled, it is estimated that the use of the segregated system has resulted in decreased copper concentrations in the POTW's effluent by 66%.

Copper Sludge Generation Rates For the Segregated Treatment System



* This information is based on Molex's quarterly reports, which cover project performance from 8/7/98-8/7/99

Reduction in the Concentration of Copper in the Effluent

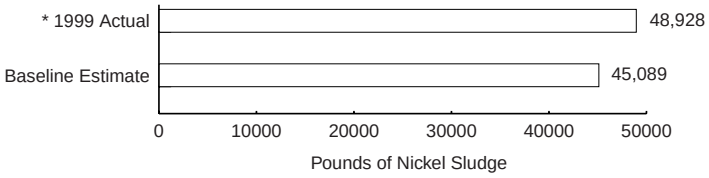


* This information is based on Molex's quarterly reports, which cover project performance from 8/7/98-8/7/99

Nickel Sludge Generation and Loading

In the Baseline Report, Molex estimated that 45,089 pounds of nickel sludge would be generated with the segregated treatment system. However, actual generation rates were 8.5% higher (48,928 pounds) than the estimated baseline. Based on the Quarterly Reports, and since this sludge is recycled, use of the segregated system has resulted in decreased nickel concentrations in the POTW's effluent by 67%.

Nickel Sludge Generation Rates For the Segregated Treatment System



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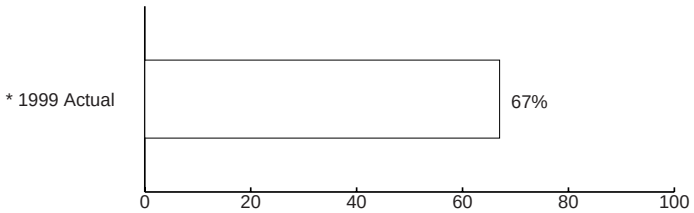
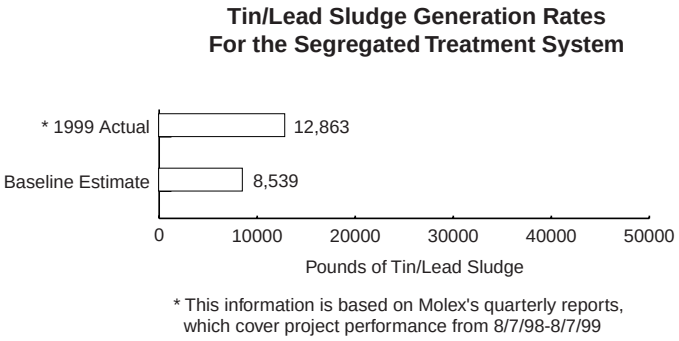
Reduction in the Concentration of Nickel in the Effluent

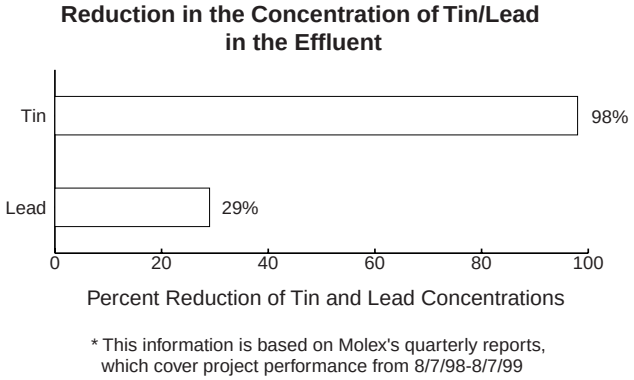


* This information is based on Molex's quarterly reports, which cover project performance from 8/7/98-8/7/99

Tin/Lead Generation and Loading

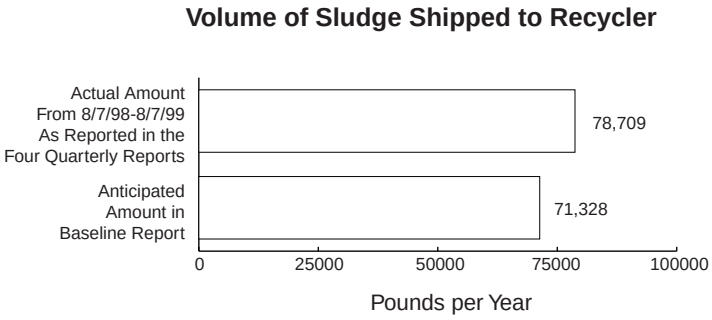
In the Baseline Report, Molex estimated that 12,863 pounds of tin and lead sludges would be generated with the segregated treatment system. However, actual generation rates were 34% lower (8,539 pounds) than the estimated baseline. Based on the Quarterly Reports, and since this sludge is recycled, use of the segregated system has resulted in decreased concentrations of tin (98%) and lead (29%) in the effluent being discharged by the POTW.





Sludge Recycling

In the Baseline Report, Molex estimated that it would be able to recycle 71,328 pounds of metals sludges in a year. However, the Quarterly Reports indicate that between August 1998 and August 1999, a total of 78,709 pounds of sludge were sent to the recycler, a 10.3% increase.



Stakeholder Participation

Molex worked to ensure that stakeholders were involved in the environmental design and impact assessment of its XL project and had an opportunity to participate fully in project development. The organizations directly involved in negotiating the FPA included Molex, EPA, NDEQ, the Lincoln-Lancaster County Health Department, and the City of Lincoln.

Meetings were held on August 24, 1996, and October 30, 1996, to discuss the Molex XL project proposal and develop the FPA. EPA received stakeholder comments on the implementation of the Molex XL project following notification to the public on November 3, 1997. While recognizing the potential benefits of Project XL, organizations such as the Environmental Defense Fund and the World Resources Company expressed concern with specific aspects of the Molex XL project. The issues of concern included apparent weaknesses in the administrative record with respect to baseline practices and historical records; determination of the com-

modity-like nature of the various sludges; and the adequacy of follow-up waste testing, particularly with respect to TOC content. In response to these concerns, EPA gathered additional data required for the administrative record, conducted further analysis of the economic value of the generated sludges, and requested that Molex implement a more comprehensive sampling and analysis program.

Meeting agendas and documents pertaining to FPA negotiations are available to the public through the State of Nebraska, EPA Region 7, and EPA Headquarters' Offices and are accessible via the Internet on the Project XL homepage. The public has been notified since initiation of this project and invited to participate, and will continue to be informed through report dissemination during implementation of the project.

Six-Month Outlook

NDEQ and EPA will continue to review analytical data and periodic reports provided by Molex in accordance with requirements in the temporary variance and the FPA. Among the factors to be considered in any final variance determination following the expiration of the existing 2-year temporary variance are

- the degree of processing the material has undergone and the degree of further processing that is required,
- the value of the material after it has been reclaimed,
- the degree to which the reclaimed material is like an analogous raw material,
- the extent to which an end market for the reclaimed material is guaranteed, and
- the ability to handle the reclaimed material in a manner that minimizes loss.

Project Contacts

- Paul Eckerson, Molex, (402) 475-1700.
- David Doyle, U.S. EPA, Region 7, (913) 551-7667.
- Mitch Kidwell, EPA Headquarters, (202) 260-2515.
- Bill Gidley, NDEQ, (402) 471-4217.
- Brian Gorman, NDEQ, (402) 471-4253.
- Annette Kovar, NDEQ, (402) 471-3585.
- Beth Mann, Lincoln/Lancaster County Health Department, (402) 441-6235.
- Lyle Christensen, City of Lincoln, (402) 441-7967.

Information Sources

The information sources used to develop this progress report were (1) the September 7, 1999, Molex FPA and (2) individual contacts with direct stakeholders.

Glossary

Baseline: The measure by which future environmental performance can be compared.

Delisting: The process of excluding from regulations a waste that the U.S. EPA has defined as hazardous, if it can be shown that the waste no longer threatens human health and the environment.

Disposal: The discharge, deposit, injection, dumping, or placing of any solid or hazardous waste on or in the land or water.

Effluent: Treated or untreated wastewater that flows out of a treatment plant, sewer, or industrial outfall. Generally refers to wastes discharged into surface waters.

Electroplating: The electrodeposition of an adherent metallic coating upon an electrode for the purpose of securing a surface with properties or dimensions different from those of the base metal.

Federal Water Pollution Control Act (FWPCA): The FWPCA of 1972 established the foundation of the current National Pollutant Discharge Elimination System (NPDES) program. This legislation and its subsequent amendments in 1976 and 1987 were enacted to address the direct connection between effluent (a point source) or runoff (a nonpoint source) and the water bodies that receive them. The 1976 amendment affirmed a legal agreement to control the growing problem of toxic discharges. In 1987, Congress amended the FWPCA again through the Clean Water Act (CWA) to address the inability of permits to meet the CWA goal of protecting swimming, fishing, and fish propagation. These amendments strengthened the ability of states to establish water quality standards.

Final Project Agreement (FPA): The FPA outlines the details of the XL project and each party's commitments. The project's sponsors, EPA, state agencies, Tribal governments, other regulators, and direct participant stakeholders negotiate the FPA.

Hazardous Waste: By-products of society that can pose a substantial or potential hazard to human health or the environment if improperly managed. Under the RCRA program, hazardous wastes are specifically defined as wastes that possess at least one of four characteristics (ignitability, corrosivity, reactivity, or toxicity), or appears on special EPA lists.

Listed Wastes: Wastes that are considered hazardous under RCRA because they meet specific listing descriptions.

Media: Specific environments–air, water, soil–which are the subject of regulatory concern and activities.

Multi-media: Several environmental media, such as air, water, and land.

Pollution Prevention Act (PPA): The Act that focuses on enhancing industry, government, and public attention on reducing the amount of pollution through cost-effective changes in production, operation, and raw- materials use. Pollution prevention also includes other practices that increase efficiency in the use of energy, water, or other natural resources, and protect our resource base through conservation. Practices include recycling, source reduction, and sustainable agriculture.

Publicly Owned Treatment Works (POTWs): Publicly owned facilities that receive and treat sewage and/or wastewater from residences, commercial activities, and industries.

Reclamation: Restoration of materials found in the waste stream to a beneficial use that may be for purposes other than the original use.

Recycling: The separation and collection of wastes, their subsequent transformation or remanufacture into usable or marketable products or materials, and the subsequent purchase of those products made from recyclable materials.

Resource Conservation and Recovery Act (RCRA): RCRA gives EPA the authority to control hazardous waste from "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also sets forth a framework for the management of nonhazardous wastes. RCRA enables EPA to address environmental problems that could result from underground tanks storing petroleum and other hazardous substances. RCRA focuses only on active and future facilities and does not address abandoned sites.

Sludges: Any solid, semisolid, or liquid wastes generated from a wastewater treatment plant, water supply treatment plant, or air pollution control device.

Substrate: Material upon which electroplating coatings are deposited.

Transportation, Storage, and Disposal (TSD) Facilities: Facilities engaged in the treatment, storage, or disposal of hazardous waste.

Toxicity Characteristic Leaching Procedure (TCLP): A laboratory procedure designed to predict whether a particular waste is likely to leach chemicals into groundwater at dangerous levels.

Variance: Government permission for a delay or exception in the application of a given law, ordinance, or regulation.

Wastewater: The spent or used water from a home, community, farm, or industry that contains dissolved or suspended matter.

Water Pollution: The presence in water of enough harmful or objectionable material to damage the water's quality.