Chapter 5 Assessment of Impacts of RCRA Subtitle C Regulation on Metal Recovery From Hazardous Waste In The United States

This chapter summarizes relevant information on RCRA Subtitle C incentives and disincentives to metal recovery. Chapter 6 will then present firm-specific case studies of how RCRA has affected metal recovery operations favorably or unfavorably. To better understand how RCRA Subtitle C regulation affects metal recovery in the United States, EPA has consulted a variety of sources of information and data. Chief among these are Bureau of Mines Commodity Summaries, economic analyses of RCRA regulations on hazardous waste recycling, trade association information, and trend data on hazardous waste recycling rates and landfill tipping fees.

Through discussions with the regulated community as well as economic analysis, EPA has identified a series of direct RCRA regulatory provisions that appear to have affected metal recovery of hazardous waste in the United States. The main provisions are those that were outlined in Chapter 4 including the derived-from rule, facility-wide corrective action, permit requirements, and financial assurance. This chapter will try to evaluate the way in which these factors impact metal recovery. However, the reader should note that these provisions perform an important role in assuring the environmentally sound management of hazardous wastes in the United States. Thus, the actual or potential disincentives these provisions may have on metal recovery must be evaluated against the environmental and other benefits the provisions provide. For example, RCRA permitting is routinely criticized for delays and expenses in recovering metals from hazardous wastes. Examination of the permit process may identify improvements. However, public participation and agency oversight are two major benefits to the public provided by the permitting process. And while other means of assuring public participation and agency oversight exist, these alternatives must be evaluated against permitting to optimize RCRA's dual goals of environmental protection and resource conservation.

It is also important to recognize that different types of metal-bearing hazardous wastes each have their own physical and chemical characteristics that may pose different risks and offer different opportunities for recovery. Because of this flexible policies are necessary to take advantage of these opportunities for recovery without resulting in an increased risk of release of hazardous metal constituents to the environment.

To understand the regulatory impacts of RCRA on metal recovery operations, it is also necessary to assess indirect regulatory and non-regulatory factors that may either facilitate or limit metal recovery of hazardous wastes. These factors include the technical and economic feasibility of recovering wastes, the costs of alternative management for metal-bearing hazardous wastes such as stabilization and landfilling, and the world demand for metals and metal products. These factors may independently affect decisions by metal recovery operations to pursue new markets for metal-bearing hazardous wastes or make new investments in additional metal recovery capacity.

As mentioned in Chapter 1, only a portion of metal-bearing hazardous wastes are amenable to metal recovery. Certain metal-bearing hazardous wastes may not be amenable to recovery because of a variety of technical or economic reasons: 1) the wastes do not contain recoverable levels of metals, 2) the wastes are too contaminated to be processed for end uses, 3) the wastes contain contaminants that might damage metal recovery operations, 4) there is no known technology for recovering metals from the wastes. Industry estimates are available on a portion of quantities of metal-bearing hazardous waste that are amenable to metal recovery. This information is summarized below in Section 5.1.1.5 (Metal Recovery Coalition). However, the lack of a comprehensive estimate on the total amount of metal-bearing hazardous waste that is amenable to metal recovery limits EPA's ability to evaluate how RCRA is affecting metal recovery and how environmentally sound metal recovery can be encouraged.

In addition to the amenability of waste metals to recovery, the cost of hazardous waste treatment and disposal as an alternative form of management to metal recovery is an important factor in how much metal recovery of hazardous waste occurs in the United States. Hazardous waste treatment and disposal costs are regulatory factors (e.g., treatment and disposal cost avoided) which may indirectly affect metal recovery by raising the cost of substitute management. The costs of hazardous waste treatment and disposal are important determinants of how much a metal recovery operation may charge its customers in user fees and still remain competitive. As treatment and disposal costs increase due either to decreasing capacity or increased demand for these services, metal recovery will become more cost effective as a management alternative. Trends in treatment and disposal costs are summarized below in Section 5.2.1.

If treatment and landfill prices are important factors of setting metal recovery user fees, world demand for metal commodities and products are important indicators of revenue metal recovery operations may derive from the sale of recovered metal products. Markets for primary metals influence prices paid for secondary and scrap metal. A review of trends for major metal commodities is summarized later in this chapter.

5.1 RCRA Regulatory Incentives and Disincentives To Metal Recovery Of Hazardous Wastes In The United States

This section summarizes information on the type and extent of RCRA regulatory incentives and disincentives to metal recovery of hazardous waste in the United States. To collect and evaluate this information, EPA utilized two sources of information: trade association information and economic analysis for recycling completed for EPA during RCRA Reauthorization hearings in 1991.

EPA requested information from 5 trade associations representing generators and reclaimers of metal-bearing hazardous waste. EPA solicited information on the type and quantities of wastes generated or recovered by trade association members, how these materials were managed, how RCRA regulations affected metal recovery of these materials, and what various approaches might do to encourage or discourage metal recovery. The information provided is summarized below.

EPA also reviewed an economic analysis completed for the Agency in 1991 on how treatment and disposal costs in RCRA compared with recycling costs for selected metal-bearing hazardous wastes.[36] This analysis compared three scenarios: current treatment and disposal costs, current recycling costs, and recycling costs under RCRA with regulatory modifications that mitigate compliance costs associated with recycling. The conclusions of this analysis are summarized below in section 5.1.2.

5.1.1 Trade Association Perspectives

As mentioned in Chapter 2, EPA has focused on metal-bearing hazardous wastes that are currently subject to full Subtitle C regulation. These include steel and electroplating listed metal-bearing hazardous wastes and spent materials that are solid wastes when reclaimed such as spent lead acid batteries.[37]

EPA solicited information from five trade associations representing metal recovery operations and generators of metal-bearing hazardous waste. These include the Steel Manufacturers Association/Specialty Steel Industry of the United States (SMA/SSIUS), the American Iron and Steel Institute (AISI), the National Association of Metal Finishers (NAMF), the Association of Battery Recyclers (ABR), and the Metal Recovery Coalition (MRC). These trade association responses have provided the Agency with a broad set of perspectives about how RCRA has affected metal recovery of hazardous waste in the U.S.. A summary of these responses follows.

5.1.1.1. Steel Manufacturers Association/Specialty Steel Industry of the United States (SMA/SSIUS)

SMA is a trade association representing the carbon steel industry in the United States. SSIUS represents specialty steel (e.g., stainless steel) manufacturers in the United States. Together their membership includes 64 firms in the U.S.. There are an additional 7 SMA members located in Canada and three in Mexico. Most members of these two trade associations operate electric arc furnaces that use scrap metal as a major portion of their feedstock.

The main hazardous waste streams generated by SMA/SSIUS members are K061, electric arc furnace dust, and K062, spent pickle liquor from steel finishing operations. SMA/SSIUS state in their response that metallic wastes containing chromium, nickel, lead, cadmium and zinc generated by their industry are amenable for recovery if the economics were favorable. Most K062 generated is not amenable for metal recovery because it does not contain recoverable levels of nickel and chromium.

SMA/SSIUS indicate that the greatest RCRA regulatory disincentives to metal recovery of hazardous wastes generated in their industry include the "derived-from" rule, hazardous waste transportation cost (and the lack of adequate metal recovery facilities in the United States), potential Superfund liability, and the cost of metal recovery compared with other management options.

SMA/SSIUS state that the derived-from rule has discouraged investment in on- site or regional recycling operations because of the additional cost of residual management. SMA/SSIUS also report that hazardous waste transportation cost is also a regulatory disincentive to metal recovery of steel wastes. SMA/SSIUS report that member companies spend an average of $650,000 annually in transportation costs to ship K061 off site for reclamation. The average steel company spends a total of $1.4 million annually to recycle its K061. SMA/SSIUS believes these costs are the result of the lack of adequate metal recovery capacity in the United States.

SMA/SSIUS state that potential Superfund liability from metal recovery operations is a serious disincentive to metal recovery from hazardous wastes. Their response states that metal recovery is problematic because metal recovery involves a number of byproducts and intermediate materials which must be managed off-site from the recovery facility. In a traditional treatment and land disposal management scenario, the entire mass of the waste is treated and managed in one location. This difference between metal recovery and land disposal, SMA/SSIUS argue, may raise the risk that generators will become potentially responsible parties (PRPs) at Superfund sites. They add that metal recovery sites may be at greater risk for being designated as Superfund sites due to prior contamination from pre-existing facilities.

In terms of state regulation, SMA/SSIUS claims that Pennsylvania state regulations on recycling hazardous waste are a disincentive to metal recovery. The State's "PK-4" regulations, adopted in 1992, may require permits for metal recovery operations (such operations are subject to storage permit requirements currently under Federal law, generally the reclamation process itself is exempt from regulation). They add that the State's interpretation of the scope of hazardous waste regulation over intermediate materials is, in their view, overly conservative and that inhibits recycling.

According to SMA/SSIUS, the opportunity cost to society for environmental regulation of hazardous waste in the steel industry is less capital available for R&D, higher steel prices, a less competitive industry in the world market and a trend toward increased landfilling and disposal for hazardous wastes. SMA/SSIUS recommend setting alternative regulatory standards for hazardous wastes managed for metal recovery that would include:

1. Elimination of the "derived-from" rule.

2. Retention of the following exemptions from RCRA requirements: for characteristic sludges and by-products being reclaimed; secondary materials used or reused as ingredients in production processes, effective substitutes for commercial products or returned to the original process without being reclaimed.

3. Substitution of self-implementing management standards for "hazardous reclaimable/recyclable material" (a term to replace "hazardous waste" if the materials are recycled") for permit requirements. These standards would include contingency planning, personnel training, release response, off site shipment standards, storage prior to recovery, notification, recordkeeping, general facility standards, unit-specific corrective action and financial assurance, and conditional exemption from the "derived-from" rule for process residuals.

4. Streamlined reporting, recordkeeping and transportation requirements, federal guidance on the distinction between wastes and products, and treatment and storage.

5. The establishment of incentives (such as tax exemptions, or low interest loans) for research and development to facilitate development of new metal recovery operations in the United States.

In response to Agency solicitation of various approaches to encourage environmentally sound metal recovery, SMA/SSIUS favor conditional exclusions or variances from the definition of solid waste at the point of insertion of the hazardous waste into a recovery process. SMA/SSIUS favor this approach over a conditional exclusion at the point of generation of the waste because they felt that implementation of an exclusion from the point of generation would be problematic. The latter approach would, SMA/SSIUS feel, compel EPA to narrowly interpret the exclusion and possibly subject generators to liability if secondary materials are not managed to meet the terms of the exclusion after they leave the generator's custody.

SMA/SSIUS generally favored streamlined reporting, recordkeeping and transportation requirements, Federal guidance on the distinction between wastes and products, and treatment and storage. SMA/SSIUS also favored the establishment of a national research and development program to facilitate development of new metal recovery operations in the United States.

5.1.1.2. American Iron and Steel Institute

AISI represents 33 domestic steel companies located in 25 states. Its members include 25 integrated steel companies, 2 iron ore producers and a number of electric arc furnace producers. The main metal-bearing hazardous wastes generated by AISI membership are K062, spent pickle liquor from steel finishing operations, K061, electric arc furnace dust; and F006, wastewater treatment sludge from electroplating operations. AISI stated in their response that the hazardous wastes generated with the greatest potential for recovery include K062 for iron recovery, D008 (characteristic lead waste) for lead recovery, and F006 for chromium recovery.

The greatest RCRA regulatory impediments to metal recovery identified by AISI members are RCRA permits, the "derived-from" rule, and corrective action/financial assurance. Other RCRA impediments stated include hazardous waste shipping costs and the 90-day storage limit for generators. One AISI company indicates that the derived-from rule has necessitated the disposal of scale (iron oxides formed on the surface of steel) generated by pickling as a hazardous waste (K062). The respondent states that this material could be used as a raw material in an electric arc furnace but that the derived-from rule and EPA rulings that screening, draining or separating scale constitutes treatment leads to the disposal of the material.

AISI believes that RCRA permitting requirements discourage metal recovery because of the time and resources required to complete the process as well as the permit linkage between permitting and facility-wide corrective action and financial assurance.

Some AISI companies note that metal recovery is problematic because of the lack of availability of metal recovery operations in the United States. The lack of metal recovery operations that are geographically proximate to the steel operations necessitates long off-site shipments which are expensive, given hazardous waste hauler fees. For some firms, this can make disposal in local hazardous waste facilities cost-effective.

In discussions with EPA, one AISI member company, National Steel Corporation/Great Lakes Division indicated that RCRA Subtitle C regulations were a major contributing factor to the closure of its Detroit facility.[38] In 1987 and 1988, the National Steel facility in Detroit generated about 12,000 tons of K061 emission control dust per year. The material was disposed of without treatment in a Subtitle C landfill about 45 miles from Detroit. When treatment standards for K061 went into effect in 1988, treatment and disposal costs for K061 increased the facility's operating cost substantially. The firm examined alternatives to land disposal including metal recovery in Pennsylvania. However, National Steel considered hazardous waste shipping costs associated with this option prohibitive.[39] In part due to increased disposal cost and in part due to rising scrap metal costs (a feedstock of electric arc furnaces), National Steel made a decision to close the facility. Approximately 500 jobs were lost due to the closure. The facility is currently idle and on the market.

AISI states that a fraction of its member companies pay an average of $2.7 million in RCRA Subtitle C compliance costs annually. They believe that this results in missed opportunities for investment in capital projects and job creation that would permit the U.S. steel industry to operate more competitively.

Like SMA/SSIUS, AISI has identified Pennsylvania PK-4 regulations as state disincentives to metal recovery. AISI also identified Michigan's categorization of zinc as a toxic characteristic waste as a disincentive to metal recovery.

When EPA asked the Institute to respond to alternative proposals to full RCRA Subtitle C regulation, AISI indicated a preference for a conditional exclusion from the definition of solid waste at the point of generation. In contrast to SMA/SSIUS, AISI prefers this exclusion at the point of generation rather than at the point of insertion to a metal recovery process.

To ensure environmentally sound recycling, AISI proposes that the generator and recovery operation submit a management plan to EPA with a process description and safeguards to demonstrate environmental protectiveness. AISI supports minimal management standards to apply to each plan that would include:

1. Retention of a limit on speculative accumulation.

2. No placement on the land for secondary materials.

3. Air installation and operating permits.

4. National Pollution Discharge Elimination System Permits (for water releases).

5. Recordkeeping and reporting requirements.

In response to other alternative approaches mentioned by EPA, AISI favors streamlining of recordkeeping, reporting and transportation requirements. AISI specifically commented that all Department of Transportation licensed haulers (or state equivalent) should be allowed to transport metal-bearing secondary materials to a metal recovery facility. The Institute favors class or generic delistings for process residuals provided an appropriate measure of hazard can be developed (AISI feels that the Toxicity Characteristic Leaching Procedure that EPA currently uses is too conservative).

Other AISI comments to encourage metal recovery of hazardous waste include: 1) creating a separate Subtitle under RCRA for metal-bearing secondary materials being reclaimed, 2) separating RCRA permitting requirements from financial assurance and facility-wide corrective action requirements, and 3) simplifying regulatory requirements for innovative technologies for metal recovery and reuse.

5.1.1.3 National Association of Metal Finishers

The National Association of Metal Finishers (NAMF) represents 699 members in 40 states. NAMF estimates that there are 3300 metal finishing operations nationwide. In contrast to steel operations, metal finishing operations are smaller in size and more numerous. The main metal-bearing hazardous waste generated by NAMF members is F006, wastewater treatment sludges from electroplating operations. This is a listed hazardous waste often containing recoverable levels of copper, nickel, chromium, zinc, lead and cadmium. NAMF members also generate F007, spent cyanide plating bath solutions from electroplating operations, as well as characteristic lead and cadmium wastes.

NAMF reports that F006 is the waste stream generated by its membership with the greatest potential for recovery. It estimates that currently about 15 to 20 percent of F006 is recovered annually. As with other metal-bearing hazardous wastes, NAMF reports that members make decisions about managing for disposal or recovery based upon two factors: cost differences between disposal and recovery and the liability risk for disposal versus recovery.

NAMF believes that metal recovery capacity in the United States is constrained by high operating costs attributable to RCRA regulation. Because of high hazardous waste shipping costs, geographic proximity to metal recovery or disposal facilities may be a major factor in cost comparisons also. NAMF reports that member companies currently spend on average approximately $36,000 annually in shipping and disposal costs.

Overall, NAMF believes that the greatest RCRA disincentives to metal recovery are the derived-from rule, the 90-day storage limit for generators, and application of Land Disposal Restriction treatment standards to plating wastes. NAMF believes that the derived-from rule constrains the creation of additional metal recovery capacity in the United States and adds to the expense of existing capacity.

The 90-day storage limit for generators states that generators have 90 days to store hazardous wastes in tanks, containers or containment buildings without a permit (40 CFR §262.34). This is to provide generators with sufficient time to accumulate sufficient quantities of materials to ship off-site. NAMF states that this time period is simply not sufficient for its members to accumulate sufficient waste to make it cost-effective to ship for reclamation. When disposal facilities are closer than metal recovery operations to member companies, metal finishers may select disposal over recovery to take advantage of reduced shipping costs. NAMF believes that longer accumulation times at generator sites would facilitate selection of recovery as an option since the per ton cost of shipment would drop with larger quantities.

The third major RCRA regulatory disincentive to metal recovery stated by NAMF is the application of the Land Disposal Restriction treatment standards for F006. These standards for F006 non-wastewaters specify a concentration level of waste extract for cadmium, chromium, lead, nickel and silver. The treatment levels are based on stabilization. NAMF believes that these treatment standards add substantial volume to the waste leading to depletion of hazardous waste land disposal capacity. The Association also believes that this has the effect of discouraging pollution prevention because of the expanded volume of the waste as well as diverting scarce capital at the site to invest in source reduction alternatives.

In terms of different approaches to encouraging metal recovery in RCRA, NAMF favors establishing a new Subtitle under RCRA for recovered secondary materials. It also favors a conditional exclusion from the definition of solid waste at the point of generation. The Association favors conditions limited to a one-time notification and an extended storage limit on-site.

5.1.1.4 Association of Battery Recyclers/RSR Corporation

To evaluate the effect of RCRA Subtitle C regulation on the spent lead-acid batteries (SLABs), EPA requested information from the Association of Battery Recyclers (ABR). RSR Corporation, a secondary lead smelter that is not a member of ABR, also submitted a response to the Agency. Their responses are summarized below. This information will be compared with other data on SLAB recovery that EPA has analyzed later in this chapter.

ABR is a trade association composed of member companies that reclaim lead and plastic from SLABs and other lead-bearing materials. ABR represents 9 member companies operating 14 facilities in 10 states. According to its response, ABR members recycle about 80 million batteries annually. ABR states that lead paint remediation wastes are the metal-bearing secondary materials with the greatest potential for recovery that are not being recovered now. ABR believes that in order to recover these materials that their supply would have to be ensured through regulation leading to their mandated removal or remediation.

When asked about which RCRA Subtitle C regulatory provisions were the greatest impediments to metal recovery, ABR states that the Land Disposal Restrictions (LDR) requirements, state determinations regarding the status of partially-reclaimed materials and RCRA Part B permitting costs have been the most problematic. According to ABR, LDR requirements either have or will substantially raise member companies operating costs by requiring retrofitting of current storage areas to meeting containment building standards[40] for secondary containment and leak detection. ABR also believes that LDR will substantially increase residual management costs to its members through increased treatment/stabilization costs for characteristic slag. ABR believes that this will also adversely affect the Nation's hazardous waste landfill capacity.

ABR states that a lack of uniformity in state regulatory determinations on the status of partially-reclaimed secondary lead-bearing materials is a major regulatory impediment in lead recovery from hazardous wastes.[41] According to ABR, differing state regulatory interpretations on whether or not lead-bearing secondary materials are or are not solid wastes (and hazardous wastes) discourage environmentally sound metal recovery by confusing and frustrating generators of lead-bearing secondary materials frequently leading them to select alternatives to metal recovery (e.g., export for recovery, disposal or treatment).

ABR believes that Part B permit compliance costs also represent a serious impediment to battery recovery. The time and transaction costs associated with obtaining the permit limit the amount of revenue available for secondary smelters to invest in new capacity or technological innovation. ABR estimates that member companies have expended on average $900,000 to $1 million per facility to prepare and obtain a RCRA Part B permit. Labor costs to administer the permit are estimated at $400,000 to $700,000 per permit. Finally, capital investments associated with retrofit and/or new construction of containment buildings are estimated between $750,000 to over $1 million per facility. ABR estimates that total RCRA compliance costs since 1989 at $6 million per facility for some ABR members. EPA has not verified these estimates.

In addition to LDR, uncertain state regulatory determinations regarding partially-reclaimed materials, and Part B permit requirements, ABR identified a number of other Federal environmental statutes that may impose regulatory disincentives to metal recovery. The most significant of these is Superfund. ABR notes the time and expense invested by generators and owner/operators of secondary smelters to minimize the risk of Superfund liability. ABR describes on-site audits of recovery facilities and protracted negotiations between generators and recovery facilities, as well as lending institutions concerns about lender liability. Other Federal environmental statutory programs that ABR mentioned as potentially impeding increased recycling include:

- potential more stringent pretreatment requirements for metals following Clean Water Act Reauthorization,

- hazardous air pollutant (HAP) testing and associated uncertain compliance costs with Clean Air Act implementation,

- potential changes to Safe Drinking Water Act (SWDA) standards (ABR is concerned that this might cause EPA to modify the Toxicity Characteristic level for lead which is based in part upon SWDA maximum contaminant levels (MCLs) which could affect their residuals such as slag).

In response to EPA questions about alternative approaches to regulating metal recovery of hazardous waste, ABR generally favors class or generic exclusions for process residuals (e.g., slag). The Association states that some of its members support the concept of case-by-case RCRA facility standards applicable to individual facilities. Other ABR members feel that such self-implementing standards are difficult to administer. ABR believes that Federal guidelines on distinguishing recycling from treatment and/or storage are of little value if states retain authority to promulgate more stringent requirements.

Although not a member of ABR, RSR Corporation is a major recovery firm of SLABs and other lead-bearing materials. RSR requested an opportunity to provide input into this report. RSR operates 3 facilities in 3 states. RSR processes 412,000 tons of SLABs, approximately one out of every three in the United States. RSR also processes 20,000 tons of other lead-bearing materials. The company recovers lead from its process.

RSR believes that uncertainty regarding the regulatory status of partially-reclaimed materials and the derived-from rule are the major regulatory impediments in RCRA to metal recovery. RSR states that designating sulfur and chloride impurities removed from K069, emission control dust from secondary lead smelting, as K069 itself because of the derived-rule will interfere with beneficial lead recovery. The company believes that the K069 designation of these impurities will create an incentive to leave these materials in the K069 that is reinserted into secondary lead smelters.

RSR asserts that this will frustrate pollution prevention because the company believes that substantial quantities (1300 to 2500 tons per year) of sulfur dioxide emissions will not be removed from the environment and the presence of these contaminants will contribute to the premature wear of RSR equipment due to acid damage from the impurities. RSR believes the RCRA Section 3001 exemptions for waste generated by primary smelting facilities are also serious impediments to metal recovery of hazardous waste.

RSR feels that most of the alternative approaches discussed by EPA would do little to encourage additional metal recovery of secondary lead-bearing materials. RSR feels that the definition of solid waste itself fundamentally overregulates secondary materials and that a major structural change in the definition is required. RSR has specifically recommended that EPA modify one of its exclusions to the definition of solid waste at 40 CFR §261.2(e)(iii)[42] to include secondary operations. RSR proposes also that pretreatment, e.g., removal of impurities, should not constitute reclamation.

5.1.1.5 Metals Recovery Coalition

The Metals Recovery Coalition (MRC) is an affinity group of metal recovery firms in the United States. MRC includes 28 firms operating more than 150 facilities in 48 states. MRC was formed in April of 1992 to lobby Congress and EPA for statutory and regulatory reform during RCRA reauthorization. MRC member companies process both hazardous and non-hazardous wastes and secondary metal materials.

Two of the larger companies in the group are involved primarily in recovering emission control dust from electric arc furnaces (K061, a listed hazardous waste) for the steel industry. Other hazardous wastes recovered include electroplating sludge, nickel-cadmium batteries, and K062 spent pickle liquor from steel finishing operations. MRC has identified a series of metal-bearing secondary materials that are amenable to recovery and are not currently being recovered. A partial list of estimated quantities generated includes:

• electroplating sludge	900,000 tons/yr
• surface finishing wastes	500,000 tons/yr
• brass foundry materials	300,000 tons/yr
• ferrous foundries materials	200,000 tons/yr
• galvanizing wastes	50,000 tons/yr
• spent chromium refractories	25,000+ tons/yr
• nickel-cadmium batteries	10,000-20,000 tons/yr
• chromium leather	
• tanning wastes	10,000 tons/yr
• superalloy slags	5,000 tons/yr
• metal catalysts	500-1000 tons/yr
• ni-cd battery product sludges	450 tons/yr
• chromium tailings	60,000 tons/yr

MRC believes that to actually recover these materials several regulatory modifications would be required. MRC believes that recovery of secondary materials is really a manufacturing process rather than a waste management activity. As such, MRC believes that legitimate metal recovery operations should be exempt from RCRA Subtitle C and regulated in a similar manner to "other manufacturing operations".

MRC believes that the derived-from rule, discussions of "sham recycling" and the stigma of hazardous waste designation inhibit recovery of these materials. MRC believes that the derived-from rule discourages the utilization of non-hazardous materials (e.g., slag) for beneficial uses such as construction materials. MRC believes that "sham recycling" (the concept that a facility is conducting treatment and claiming to recycle) is an idea developed by the treatment and disposal industry to retain market share over recyclers.

MRC regards the derived-from rule, Part B treatment permit requirements in some states, and facility-wide corrective action as the three greatest RCRA disincentives to metal recovery. Other disincentives cited include stigma, legitimacy determinations (sham recycling), Part B storage permit requirements and Land Disposal Restriction requirements.

According to MRC, the derived-from rule has the potential to make the economics of metal recovery from hazardous wastes prohibitive. If applied to all metal recovery residues, at an average of $300 to $350 per ton, hazardous waste landfilling costs would translate into millions of dollars of additional operating costs for firms.

In addition to the added operating cost, MRC believes that the derived-from rule acts as disincentive to metal recovery because it results in continuing risk of potential liability under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) also known as Superfund.[43]

MRC states that Part B treatment permit requirements are serious disincentives to metal recovery. Although the federal RCRA program does not require a permit for the recycling process, treatment permit requirements may be a potential concern in one of two ways. First, the appropriate state regulatory agency may regulate the recycling process more stringently than the Federal government. North Carolina currently requires permits for recycling operations. Pennsylvania has also promulgated regulations that will require treatment permits for metal recovery operations (the PK-4 regulations). The second way that a metal recovery operation may become subject to a Part B treatment permit is if the state or Federal regulatory agency determines that a process is not legitimate. That is, if a recovery operation is believed to be really doing treatment and the recycling is incidental or sham, a treatment permit may be required.

MRC estimates of Part B treatment permit costs are between $250,000 to $800,000 per facility. MRC believes that many of RCRA Subtitle C treatment and storage permit requirements are duplicative of Clean Air Act and Clean Water Act regulations. MRC states that both costs and time delays of obtaining a permit for a new facility are potential problems. Or if new permit requirements are added for existing facilities, this is problematic if space is not available on-site.

MRC states that facility-wide corrective action is the third greatest RCRA regulatory disincentive to metal recovery. MRC believes that facility-wide corrective action may discourage a decision to invest in a new metal recovery facility or to site a facility in an existing manufacturing site. MRC believes that a regulatory disincentive to site a facility in an existing manufacturing site is environmentally unsound (presumably because the damage caused by a release to the environment in a pristine area is greater than in an industrial park). MRC believes that this discourages investment in urban enterprise zones where job creation and expansion of the tax base are needed.

MRC has summarized the opportunity cost to the United States from RCRA regulatory compliance costs as lost metal recovery capacity, lost investment in capital projects and associated job creation in the metal industry. Additional opportunity cost, MRC believes, is the reluctance of metal-bearing hazardous waste generators to support expansion of new metal recovery technologies due to regulatory consequences. MRC believes that generators of electric arc furnace dust, K061, feel that because the technology to recover the dust preceded its listing as a hazardous waste that the technology led to the regulation. MRC believes that generators will be reluctant to support new recovery technologies if they lead to new regulations.

In response to various alternative approaches to managing metal-bearing hazardous wastes, MRC reiterated its basic belief that metal recovery is a manufacturing process rather than a form of waste management. As such, it favors an unconditional exclusion from the definition of solid waste. However, if a conditional exclusion is the selected alternative, MRC proposes minimal notification, recordkeeping and reporting requirements for generators and metal recovery operations. Specific requirements MRC would support include:

- one time notification from generators/reclaimers stating that they are claiming the exclusion,

- notification from generators/reclaimers for speculative accumulation for more than a specified time between generation and shipment or receipt and processing,

- recordkeeping by generators stating quantities of secondary materials generated, time between generation and shipment, destination of shipment of secondary materials; recordkeeping by reclaimers stating quantities and sources of materials received, time period between receipt and processing, quantities of metal or metal equivalent recovered.

MRC believes that this set of conditions would allow EPA to detect sham recycling operations without undue intrusion into secondary metal recovery. MRC would not apply the derived-from rule to metal recovery process residues. With respect to other alternative regulatory approaches, MRC comments that use of self-implementing standards such as permit-by-rule provisions are less helpful than a conditional exclusion from regulation but preferable to full permitting. MRC favors Federal guidelines or rules to delineate between recycling and treatment or recycling and storage.

5.1.1.6 Summary and Analysis of Trade Association Information

In general, trade association's identified the following as the most significant RCRA regulatory impediments to metal recovery: the derived-from rule, RCRA Part B permitting (storage or treatment), facility-wide corrective action, hazardous waste shipping costs, LDR treatment requirements and prohibitions on storage of restricted waste. Additionally, generator respondents commented that the 90 day storage limit for storing hazardous wastes in tanks or containers was not sufficient to encourage metal recovery.

With respect to alternative regulatory approaches for managing metal-bearing secondary materials, respondents generally favor conditional exclusions from the definition of solid waste applying either at the point of the waste's generation or at the point of its insertion into a metal recovery process. Respondents support limited conditions on the exclusion including some form of notification or reporting tied to a quantity and time limit to prohibit long term storage of recoverable materials. Some respondents supported further management standards.

Self-implementing management standards still subject to RCRA regulation are generally regarded as a less desirable alternative to conditional exclusions from regulation, but still preferable to full Part B permitting. Reaction to Federal guidelines distinguishing between recycling and treatment or recycling and storage is mixed. Some respondents feel that such guidance is part of other approaches such as conditional exclusions. Others feel that such guidance is a minor fix to what is a more fundamental problem with the definition of solid waste.

All respondents were reluctant to identify RCRA provisions that they believed were beneficial to environmentally sound metal recovery. However, when asked to compare disposal costs with recovery costs, some respondents acknowledged that increasing disposal and treatment costs due to RCRA have made metal recovery a more attractive alternative. Metal recovery of secondary materials before and after RCRA regulations went into effect will be summarized later in this chapter.

5.1.2 Economic Analysis of RCRA Subtitle C Regulation On Selected Metal-Bearing Hazardous Wastes

In March 1991[44], EPA finalized a study commissioned by the Agency on the economics of recycling and treatment/disposal of hazardous wastes to determine which management alternative was most cost-effective under RCRA Subtitle C. As part of this project, the Agency directed economic analysis on recycling with regulatory modifications to determine whether or not these changes to RCRA Subtitle would provide any additional incentive to recycle hazardous wastes.

The study included 4 metal-bearing hazardous wastes[45]- F006 wastewater treatment sludge from electroplating operations, F007 spent plating baths from electroplating operations, K061 emission control dust from electric arc furnaces in secondary steel production, K062 spent pickle liquor from steel finishing operations- in the analysis. As mentioned above, the study included analysis of three scenarios: base treatment and disposal, recycling under current regulations, recycling with regulatory modifications. For recycling with regulatory modifications, the study analyzed four possible regulatory modifications:

1) permit-by-rule; recyclers are subject to self-implementing management standards without being subject to permits (either for storage or BIF requirements),

2) corrective action waiver; recycling operations will be exempt from corrective action requirements unless they have other units requiring a RCRA permit on-site,

3) derived-from rule exemption; residues from recycling operations would not be deemed hazardous unless the residues themselves are listed or exhibit a toxicity characteristic,

4) storage pile exemption; storage piles prior to recycling are not subject to Land Disposal Restriction standards as long as the EPA Administrator deems the storage area sufficient to prevent releases to the environment.

The purpose of the analysis was to determine whether or not recycling is or could be a cost-effective management alternative for selected hazardous wastes. This summary of the study focuses on four major listed metal-bearing hazardous wastes to ascertain whether or not the RCRA Subtitle C regulations currently provide incentives for metal recovery. This summary also critiques study's conclusions regarding the additional incentives provided by regulatory modifications for selected metal-bearing hazardous wastes.

The study identified several important limitations[46] in its methodology including limited review of recycling technologies selected for the analysis, impacts of non-economic factors on metal recovery (including technical feasibility), and whether or not pollution prevention may be a more cost-effective alternative. In addition, EPA's review during completion of this report of the study indicates several mistaken assumptions of metal recovery processes.[47] Notwithstanding these qualifications, the study provides valuable insight into the issue of how RCRA Subtitle C regulations affect metal recovery of hazardous wastes.

In contrast to the trade association information described above which emphasized the ways that RCRA regulation constrains metal recovery, the study showed that under RCRA Subtitle C regulation that metal recovery is more cost-effective than treatment and disposal for the listed metal-bearing hazardous wastes under review. The analysis also concluded that the recycling with regulatory modifications being proposed would provide additional incentives for metal recovery of hazardous wastes from the steel industry, K061 and K062, but not the electroplating industry, F006 and F007. However, as mentioned below, EPA believes recycling with regulatory modifications may benefit off-site recovery of electroplating wastes.

The study modeled cost comparisons for three facility sizes (small, intermediate, and large) for each of the waste streams selected. Each size facility was assumed to use a specific form of treatment/disposal and metal recovery depending upon the economics of the recovery process. With one exception[48], for the 4 metal-bearing hazardous wastes included in the analysis, metal recovery under current RCRA Subtitle C regulation is more cost-effective than traditional treatment or disposal for all size facilities and processes. This finding also included facilities which had sunk (i.e., invested) capital in base case treatment systems.

The study's examination of regulatory modifications indicates that the modifications considered would benefit steel wastes more than electroplating wastes. The study assumed in its analysis that electroplating operations will manage rinsewaters in tanks that are exempt from permits and that therefore permit and corrective action (which is tied to permits) regulatory modifications will not facilitate metal recovery of plating wastes. The study concluded that these operations will also either not produce a residual or the residual will be characteristically toxic so that in either case an exemption from the derived-from rule will not make metal recovery more cost effective. Finally, since plating rinsewaters are not stored in piles, the storage waste pile exemption would not facilitate metal recovery of these wastes.

By contrast, the study concluded that metal recovery for K062, spent pickle liquor from steel finishing operations, would be encouraged by either permit-by-rule or corrective action exemptions. The study concluded that a derived-from rule exemption would not facilitate K062 recovery because the recycling residuals would still exhibit the toxicity characteristic. The study concludes that metal recovery of K061 would benefit from any of the regulatory modifications. The study's analysis regarding the benefit of possible regulatory modifications requires some clarification. The study's conclusions about the limited benefits of regulatory modifications for electroplating wastes are based on an assumption that these wastes would be managed using on-site recovery processes. If plating wastes are shipped off-site for recovery and prior storage is required, the regulatory modifications could provide substantial benefit as the study has concluded they would for off-site recovery of K061, electric arc furnace dust. In addition, any pyrometallurgical recovery of plating wastes is likely to produce a residual such as slag. This type of recovery would benefit from a derived-from rule exemption provided the slag is not characteristically toxic.

In evaluating the potential cost savings relative to total management costs from four regulatory modifications, the study concluded that generally changes to permitting requirements and a derived-from rule exemption would <u>not</u> be sufficient to change the relative economics of treatment and disposal in favor of recycling if treatment and disposal were more cost-effective to begin with.[49] The study also concluded that small facilities would benefit more relative to large facilities from such modifications.

In contrast, the study concluded that a corrective action exemption would provide a strong incentive for recycling particularly for small facilities. The storage waste pile exemption was determined to be beneficial for affected wastes but of limited applicability since many wastes are not managed in piles.

On important question raised by the study's main conclusion is if metal recovery is more cost-effective than treatment and disposal under RCRA currently, why aren't recovery rates for wastes such as F006 higher than 15 to 20 percent?[50] There are several possible responses to this question.

First, it is possible that only a small portion of a particular metal-bearing waste stream is technically amenable for recovery. In the case of F006, a large portion of the wastestream may contain too much organic content such as oil and grease to be effectively recovered. If this is the case, then the recovery rate of F006 that is technically amenable for recovery could be much greater than the recovery rate for all F006 that is generated. A second possibility is that metal recovery operations are less commercially available relative to treatment and disposal facilities. If so, then additional shipping costs for distant metal recovery could offset the cost advantages of metal recovery. Finally, the study suggests that noneconomic factors may influence waste management decisions:

> "This high cost of base case treatment/disposal to meet the newly promulgated land disposal restrictions standards provides an incentive for waste generators to find other methods of waste management. Given the fact that recycling under current regulatory conditions is economical, there must be other noneconomic factors influencing facility waste management decisions. Potential factors affecting waste management decisions may include inertia, inadequate investment capital, recent technological advancements not widely known, unavailable or fluctuating markets for recycled materials, concerns about the quality of recycled materials, and issues of product specification. In addition, for facilities with sunk capital that are only incurring the cost of operation and maintenance, the economics of recycling may not be favorable due to the initial capital investment required for the recycling system."[51]

5.1.3 Conclusions on Regulatory Incentives and Disincentives To Metal Recovery

Viewing the trade association information and economic analysis presented in this section, it appears that RCRA Subtitle C regulation has both incentives and disincentives on metal recovery of hazardous waste.[52] Trade association information submitted indicates that the regulated community believes that several Subtitle C provisions including the derived from rule, RCRA Subtitle C permitting, facility-wide corrective action and hazardous waste shipping costs may be limiting factors on maximizing opportunities for additional metal recovery capacity in the United States. The study that EPA commissioned on the economics of recycling indicates that RCRA Subtitle C also has a favorable effect of encouraging metal recovery by increasing treatment and disposal costs for metal bearing hazardous waste (this is discussed further in Section 5.2). This mixed impact of RCRA incentives and disincentive is consistent with EPA's case studies of metal recovery operations presented in Chapter 6. Case study respondents indicated mixed impacts of RCRA Subtitle C regulation on their operation. Some respondents indicated mild impacts; others, more serious. The net effect of RCRA Subtitle C regulatory incentives and disincentives is assessed in Section 5.2.

5.2 Indirect Regulatory and Non-regulatory Factors Affecting Metal Recovery Operations In The United States

To properly assess the effect of RCRA Subtitle C regulations on metal recovery of hazardous wastes, it is critical to understand the indirect impact of RCRA Subtitle C on metal recovery through creating markets for metal recovery as an alternative to traditional treatment and land disposal of metal-bearing hazardous wastes. It is equally important to assess the international and domestic demand for metal commodities to assess the marketability of recovered materials from metal recovery operations.

This section will summarize trend data and the current status of these two factors and how they affect metal recovery operations in the United States. In Section 5.3, the net effect of RCRA Subtitle C regulation and other factors will be evaluated in terms of their impact on metal recovery of hazardous wastes.

5.2.1 Hazardous Waste Treatment and Disposal Costs

Essentially, metal recovery of hazardous wastes can be considered a substitute for traditional hazardous waste treatment (primarily stabilization) and land disposal. Because they are substitutes, metal recovery will be more attractive to the generator as treatment and land disposal become more expensive. Conversely, metal recovery will be less competitive if less expensive forms of treatment and disposal become available. A generator of hazardous waste will presumably seek to limit his waste management costs and long term liability.

From the perspective of the metal recovery operation, generators can be charged user fees up to the point where the user fee equals the comparable tipping charge at a treatment, storage or disposal facility (TSDF). All other factors constant, if the user fee exceeds the tipping fee, generators will elect to dispose rather than ship their wastes for metal recovery. The exception is for limited metal-bearing hazardous wastes that have recovery specified as their treatment standard under the Land Disposal Restrictions (LDR). As mentioned previously, LDR specify treatment levels for restricted wastes prior to their disposal on the land (40 CFR Part 268). Although usually the specified treatment is a performance level for either the waste extract (i.e., leachate) or waste concentration itself (i.e., total levels), for selected metal-bearing hazardous wastes such as nickel-cadmium batteries, spent lead acid batteries and high-category mercury wastes, the LDR specifies recovery as the treatment standard. For these latter wastes, even if tipping fees for treatment and disposal are less expensive than recovery, these wastes must still be recovered because of the LDR.

In the past, metal recovery projects may have been constrained due to low tipping fees for treatment and disposal. For example, in 1986 one feasibility study on the economics of citing a central recovery facility to process plating wastes in Missouri concluded that the facility could not operate profitably because the user fee it would have to charge to become profitable would be substantially higher than the transportation cost and disposal costs of shipping the wastes to a locally located Subtitle C landfill[53]. This study was completed prior to the promulgation of LDR treatment standards for plating wastes. It is likely that the economics would change substantially if treatment costs were factored into the analysis.

Data and economic analysis indicate that land disposal and treatment costs have increased substantially over the last ten years. The treatment and disposal costs avoided when hazardous wastes are managed for metal recovery are a powerful regulatory incentive to recover rather than dispose of wastes.

One report indicates that hazardous waste treatment and disposal costs increased from an average of $153 per ton in 1984 to an average of $239 per ton in 1990.[54] This report projects that hazardous waste treatment and disposal costs would increase to an average of $384 per ton by 1995. A 1990 commercial survey summarized as a final report in July 1992 for EPA indicates that most of the increase in this cost is treatment cost (stabilization).[55] Survey respondents in the report indicated significant increases in wastes going for stabilization since 1987. The report attributes this increase to LDR treatment standards for heavy metals and states that there is near unanimous agreement among surveyed firms that this is the case.[56] The report also attributes most of the increase in stabilization cost to LDR treatment standards that compel more expensive stabilization processes to attain the standards.[57]

Trend data indicates that increases in hazardous waste management costs will continue to increase. Annualized hazardous waste compliance costs are projected to increase from $ 1.725 billion in 1987 to $ 12.062 billion by the year 2000.[58]

The report 1990 Commercial Survey of Selected Firms In The Hazardous Waste Management Industry cited earlier included 4 metal recovery firms operating 5 facilities. In addition to attributing increases in stabilization costs to LDR treatment standards, the report states that:

> "Waste volumes going to metal recovery have increased substantially since 1987 as LDRs raised the cost of waste management involving land disposal. Air pollution control dusts from primary steel production in electric arc furnaces (RCRA waste code K061) were responsible for most of the increase. LDRs for characteristic metal wastes and metal finishing wastes (e.g., electroplating waste sludges) also contributed to this growth.[59]

The report continues that metal recovery will experience a dramatic increase in quantities of wastes processed. The report states that the reasons for the expected growth are: 1) LDRs will continue to increase the cost of conventional hazardous waste treatment and land disposal, 2) hazardous waste landfill capacity will decrease creating an incentive to look for alternatives, 3) waste generators believe metal recovery will lower liability concerns, and 4) municipal waste regulations will force manufacturers of metal-bearing waste streams such as spent nickel-cadmium batteries to take back these materials and manage them as hazardous wastes.

Some survey respondents in the report noted that some metal recovery operations still have difficulty in competing in price with stabilization and landfilling.[60] However, survey respondents identified metals recovery as a growth market more frequently than any other form of treatment or resource recovery listed in their response.[61]

As mentioned previously at the beginning of this chapter and this report, it should be noted that increasing treatment and disposal costs, while important regulatory incentives for metal recovery of hazardous waste, cannot ensure that additional metal recovery will occur. To reiterate, some metal-bearing hazardous wastes are simply not amenable to recovery either technically or economically. In other cases, metal recovery operations may not be geographically proximate to generators so that increased hazardous waste transportation costs to metal recovery operations may offset any price advantage that the recovery operation offers over treatment and disposal. Notwithstanding this qualification, it appears empirically that increased treatment and disposal cost are largely responsible for increased recovery of hazardous waste since 1980.

5.2.2 Metal Prices In The United States and Their Relationship To Metal Recovery of Hazardous Waste

Metal reclamation operations that recover metals from hazardous waste can derive revenue from two sources, user fees and earnings from the sale of recovered metals. User fee revenues from generators of hazardous wastes are dependent in part upon the price of substitute treatment and disposal services. This was discussed in the previous section. Similarly, earnings from the sale of recovered metals is dependent upon the world market demand for metal commodities. This section reviews trends in U.S. metal prices from the mid-1970's before RCRA hazardous waste regulations were promulgated to 1990 when the most recent metal recovery data are available.

It is important to understand U.S. metal prices during this time frame for the following reason. In order to determine the net effects of RCRA Subtitle C regulation on metal recovery of hazardous waste, independent non-regulatory factors, such as U.S. metal prices, that may either encourage or discourage metal recovery of hazardous waste need to be evaluated. To the extent possible, the magnitude of non-regulatory factors must be assessed relative to other factors such as RCRA Subtitle C regulation.

Several considerations concerning U.S. metal prices and metal recovery of hazardous waste are in order. First, the type of secondary metal materials recovered from hazardous waste are often materials that have been partially reclaimed but need to be reclaimed further. These materials may be metal concentrates or intermediate materials which would require additional smelting or processing to complete the reclamation process. For example, a metal recovery operation may produce a zinc or lead concentrate from a metal-bearing hazardous waste such as K061 that must undergo further processing.

Thus, U.S. metal prices do not directly translate into the price paid for the secondary metal intermediates and concentrates that often come from metal recovery operations although the two types of prices are related. Primary concentrates and intermediates compete with and substitute for secondary metal intermediates and concentrates in the production of metal commodities. Independent economic factors can influence the demand for each type of material in producing the metal commodity.

Of course, when a metal recovery operation does produce a completely reclaimed material, the link between U.S. metal prices and revenue that the metal recovery operation derives from the sale of its products is a direct one. An example of the latter scenario are the metals produced at the U.S. Filter Recovery Services facility in Minneapolis, MN (the case study of this facility is presented in the next chapter). The electrowinned nickel from U.S. Filter Recovery Services is completely reclaimed and does not require further processing.[62] This material will compete with other secondary materials such as nickel scrap as substitutes for primary copper and nickel metal.

A second consideration in evaluating U.S. metal prices and metal recovery of hazardous waste pertains to the type of wastes reclaimed and the metal commodities themselves. The range of commodity prices for metals is quite wide. Looking at average 1993 commodity prices for metals typically reclaimed from hazardous waste in Table 5.1, one can see that expected revenue from metal recovered from hazardous waste depends as much on the types of metals present in the waste as it does upon the concentration of the metals.

Table 5.1 Average 1993 Metal Commodity Prices

Metal	Average 1993 Commodity Price Per Unit (London Metals Exchange Unless Otherwise Indicated)
Silver	\$4.20/troy ounce (New York)
Nickel	\$2.33/lb
Copper	87¢/lb
Cadmium	45¢(New York)
Zinc	44¢/lb
Lead	18¢/lb
Iron Scrap	4.8¢/lb (Pittsburgh, Philadelphia, Chicago)
Chromium	2.7¢/lb (South Africa), 4.9¢/lb(Turkey)

Source: U.S. Bureau of Mines, Mineral Commodity Summaries 1994.

If the metals recovered from the hazardous waste are completely reclaimed, they may sell for 80 to 90 percent of the world commodity price. If the metals recovered is an intermediate or concentrate, its value will be much less as a percentage of the world commodity price.

The degree of the incentive or disincentive of U.S. metal prices on the metal recovery of hazardous waste depends upon a number of factors including: 1) the proportion of revenue derived from the sale of recovered metals versus the revenue derived from user fees, 2) the average total cost per pound of recovering the metals, 3) the concentration and type of metals present in the waste, and 4) the type and concentration of impurities in the waste.

Other things being equal, U.S. metal prices will have a greater effect upon metal recovery operations that reclaim metals from homogenous materials that are relatively constant in composition such as spent-lead acid batteries where the commodity (lead) is of relatively high concentration and consistent quality. Historically, the recovery rates of these batteries has been closely correlated with the world price of lead (it should be noted however that this is currently not the case)[63].

For metal recovery operations that reclaim metals from industrial sludges, by-products and spent materials, these metal-bearing hazardous wastes are often variable in terms of the type and concentration of recoverable metal constituents and impurities. Often, metal reclaimers set specifications that may limit the recoverability of a large portion of specific waste stream that is too contaminated with impurities or too low in recoverable metals to be reclaimed.

Even if a metal is amenable to recovery, it may only be marketable for a lower value end use, e.g., one not requiring high levels of purity. In these situations, U.S. metal prices may not affect metal recovery in exactly the same way as it would if the recovered metal were fit for a wider variety of higher value end uses. Also, U.S. prices of lower grade metals (i.e. those with lower levels of purity) closely track prices for higher grade metals because lower grade metal prices are discounted from the higher grade metals.

Notwithstanding these considerations, U.S. metal prices is an important contributing factor influencing metal recovery of hazardous waste. This review of U.S. metal prices will focus on commodities most commonly recovered from hazardous wastes: copper, lead, zinc, nickel.

The price for metal commodities in the United States depends upon both the <u>supply</u> and <u>demand</u> or production and consumption of metals domestically and abroad. In general, when supply of a commodity is constant, changes in the price of the commodity are directly proportional to changes in demand to the commodity. So that, for example, if production of a metal is constant, an increase in the demand of lead will cause an increase in the price of the metal; a decrease in demand will cause a price decrease. In contrast, when demand is constant, the price of a metal is generally inversely proportional to its supply. In other words, if the demand for a metal remains constant, an increase in the production of the metal will decrease the price; a decrease in production will lead to a price increase.

After a post-World War II boom, world metal demand began to slow in the mid-1970's.[64] Actual trends in world metal consumption for copper, lead, zinc and nickel lagged far behind projected trends. Average annual growth rates in world consumption between 1979 and 1987 for these commodities were 0.7, 0.0, 0.9, and 1.5 percent respectively. By comparison, the rates between 1960 and 1973 were 4.8, 4.2, 5.6 and 6.4 percent.[65] Growth rates were even lower in the OECD countries.

The origins of this trend began in the Energy Crisis of 1973 and subsequent world recession. World metal production actually increased during the 1970's in spite of the slow down in world consumption. This depressed the world price of metals and minerals due to oversupply.[66]

To respond to depressed market conditions, metal producers made economic adjustments including cutting production and closing inefficient operations. Labor costs were reduced through layoffs and wage reductions. By 1986 and 1987, markets for metal had improved dramatically. According to the National Research Council, between 1986 and 1988, the value of raw mineral materials produced in the United States has doubled from $5.8 billion to $10.4 billion.[67] Factors contributing to the recovery include the economic adjustments described above and increased world metal demand resulting from economic recovery. During this time period, the average annual growth rate in world consumption of copper, lead, nickel and zinc was 2.5, 1.6, 5.6, and 3.4 percent respectively.[68]

To more specifically analyze trends in domestic metal prices and their relationship to metal recovery of hazardous waste, EPA has looked at price information provided by the Bureau of Mines[69] for four metals: copper, lead, nickel and zinc. The Agency has looked at price information over three five year periods: 1976 to 1980, 1981 to 1985 and 1986 to 1990. This information is summarized in Table 5.2 below.

The 1976 to 1980 period represents a period prior to promulgation of RCRA hazardous waste regulations when secondary materials could be discarded inexpensively without extensive liability or cost considerations. The 1981 to 1985 period represents the period when RCRA regulations were in force prior to enactment of the land disposal restriction (LDR) program. Generators of metal-bearing hazardous wastes could dispose of these wastes in landfills, surface impoundments or deep wells without being subject to treatment standards. This period also represents a period of world recession and staggered economic growth. The 1986 to 1990 period represents the period when RCRA reauthorization was complete and the LDR program was put into effect. Metal-bearing hazardous wastes became subject to treatment standards added to the expense of their disposal. As mentioned above this period was also when mining and metal producers cut production and world demand increased stimulating higher prices.

Data indicate that commodity prices in the United States for metals commonly recovered from hazardous wastes decreased in the early to mid-1980s in response to the factors of oversupply and economic recession mentioned above. These prices increased in the late 1980's due to world recovery and closure of inefficient operations. Data in Table 5.2 indicates that the real price of copper, lead, nickel and zinc in the United States was as high or higher in the mid to late 1970's before RCRA than in the late 1980's when RCRA regulations were in place.

Because of data limitations for metal recovery rates of hazardous waste during the 1980 to 1989 period, assessing the strength of the recent increase in U.S. metal prices relative to increased treatment and disposal costs as an incentive to metal recovery of hazardous waste is difficult. To some extent, the relative strength of each factor depends upon the material recovered and the presence of other factors than U.S. metal prices and treatment and disposal costs. Available data will be analyzed in Section 5.3.

Table 5.2 U.S. Metal Prices For Selected Metals Between 1976 and 1990

Commodity/Time Period	Time Period	Average Real Price Based on Constant 1987 Dollars ($/lb)[70]	Average Percentage Annual Change In Price During Period
Copper	1976 to 1980	1.262	+2.65
	1981 to 1985	0.844	-12.00
	1986 to 1990	0.997	+10.60
Lead	1976 to 1980	0.578	+9.10
	1981 to 1985	0.297	-17.5
	1986 to 1990	0.345	+16.9
Nickel	1976 to 1980	3.79	+3.7
	1981 to 1985	2.63	-9.5
	1986 to 1990	3.85	+25.9
Zinc	1976 to 1980	0.574	-7.4
	1981 to 1985	0.487	-2.4
	1986 to 1990	0.564	+11.1

5.3 Assessment of RCRA Subtitle C Regulation On Metal Recovery of Hazardous Wastes: Spent-Lead Acid Batteries and Industrial Sludges, By-Products and Spent Materials

In addition to data limitations, considerable uncertainty on the type and extent of impacts on metal recovery from independent factors complicates the assessment of the impact of RCRA Subtitle C regulation on metal recovery of hazardous wastes. Although this report has tried to summarize and evaluate the affects such factors as U.S. metal prices (probably the principle independent factor), other factors such as civil liability (nuisance suits for example), state and local government regulation (zoning), other Federal regulation such as Superfund liability, international law, anti-trust activities and criminal activity may affect metal recovery of hazardous waste.

Notwithstanding these qualifications, EPA has been able to review existing information and make general conclusions about the impact of RCRA Subtitle C regulation on metal recovery of hazardous waste. This information is presented below in below in Subsections 5.3.1 and 5.3.2.

EPA has reviewed available information on metal recovery rates for metal-bearing hazardous wastes to determine the impact of RCRA Subtitle C regulation on metal recovery of these wastes. Information to conduct this analysis is available for two categories of metal-bearing hazardous wastes: 1) spent lead-acid batteries (SLABs) and 2) industrial sludges, by-products and spent materials. Because of data limitations, portions of RCRA Subtitle C metal-bearing hazardous wastes such as commercially generated metal-bearing wastes (e.g., selected batteries, thermostats, selected photographic wastes) are not represented in this analysis. Many of these wastes are generated in the service sector as either spent materials or by-products of commerce. The potential for metal recovery of these materials is variable and should not affect the overall conclusions of this study.

Spent-lead acid batteries and industrial sludges, by-products and spent materials will be analyzed separately to determine how RCRA Subtitle C regulation has affected the recovery of these materials. This is critical since spent lead acid batteries have historically been recovered prior to promulgation of RCRA Subtitle C regulation in 1980 where industrial sludges, by-products and spent materials have not. Moreover, on the basis of available information, it appears that recovery rates for SLABs (except in 1992) appear to be more closely related to the world metal commodity prices than for industrial sludges, by-products and spent materials whose recovery may be more closely related to the cost of treatment and disposal.

5.3.1. Spent Lead-Acid Batteries

Spent lead-acid batteries (SLAB) are spent materials that are regulated as hazardous wastes under RCRA Subtitle C. SLAB are generally categorized as D008, characteristic lead wastes. SLAB are generated in a manner different than industrial hazardous wastes. Because they are generated in residential, industrial, and commercial sectors, these materials require consolidation for collection and transport prior to recovery.

To encourage cost-effective collection and transport of SLAB, they are exempt from generator, transporter and storage requirements prior to arrival at a reclamation facility, 40 CFR Part 266 Subpart G. This means that SLAB destined for reclamation can be shipped by a nonhazardous waste hauler without a hazardous waste manifest and can be stored at a consolidation point (i.e., an interim storage facility that does not also reclaim SLAB) without requiring a storage permit. Reclamation facilities such as secondary lead smelters that recover SLAB are subject to full regulation if they store SLAB prior to recovery.

EPA promulgated these regulations in 1985 when SLAB being recovered first became regulated as a hazardous waste. The reduced Subpart G requirements were developed to minimize interference with an existing infrastructure for SLAB reclamation. As mentioned below, since 1990, SLAB have been subject to a Land Disposal Restriction treatment standard requiring thermal recovery in a secondary lead smelter 40 CFR §268.42.

To reiterate the concerns of battery reclaimers as discussed above, the Association of Battery Recyclers (ABR) contends that RCRA Land Disposal Restriction (LDR) requirements (40 CFR Part 268) threaten to reduce recovery rates for SLAB by significantly increasing battery reclaimer operating costs. ABR states that LDR requirements will raise battery reclaimer costs by requiring expensive retrofitting of indoor waste pile storage areas to comply with containment building standards and requiring expensive residual management costs due to treatment of secondary lead smelter slag. ABR also remains concerned about nonuniform state regulation of SLAB and RCRA permit costs.

To evaluate industry concerns, EPA has reviewed data on SLAB recovery rates and compared them with a number of factors affecting recovery. Putnam, Hayes and Bartlett report that recovery rates for SLAB have been volatile during the period 1960 to 1985, varying largely with the price of primary lead.[71] Average SLAB recovery rates during the 1960 and 1970s were 80 percent and 72 percent respectively. Between 1981 and 1985 the average SLAB recovery rate was 69 percent. SLAB recovery rates increased from an all time low of 61 percent in 1983 to 70 percent in 1985 when SLAB became regulated as a hazardous waste.

In spite of concerns about increasing environmental regulation, recovery rates for SLAB have increased steadily between 1985 and 1990 from 70 percent to 97.8 percent, declining slightly in 1991 in response to a decrease in the price of lead. Average recovery rates and lead prices between 1987 and 1991 are summarized in Table 5.2.[72] These data indicate that SLAB recovery rates have remained relatively high in 1991 (decreasing only 1 percent) despite a 32 percent decrease in the price of world lead. This apparent anomaly may be attributed to a number of other factors including state and municipal laws prohibiting disposal of SLAB in municipal landfills, state and local deposit and refund programs for SLAB, rising Subtitle C treatment and disposal costs, and applicability of the LDR treatment standard in 1990.

Table 5.3 Spent Lead-Acid Batteries Recovery Rates/World Lead Prices 1987 to 1991

Year	Spent Lead Acid Battery Recovery Rate (expressed as percentage)	Average World Lead Price: London Metals Exchange (¢/lb)
1987	88.6	26.99
1988	91.0	29.7
1989	95.3	30.6
1990	97.8	37.05
1991	96.8	25.3

In 1993, 41 states and one city had enacted legislation promoting SLAB recovery.[73] Most of the state legislation included provisions prohibiting the disposal of SLAB in municipal landfills and requiring retailers to accept old batteries when new SLAB are purchased. The EPA report concluded that these efforts were effective in encouraging SLAB recovery. The report also indicated that the additional incentive to recycle SLAB from deposit and refund requirements was less certain.[74]

The effects of RCRA Subtitle C regulation on SLAB recovery between 1985 and 1991 is somewhat more complex than state legislation. RCRA Subtitle C regulation may serve as both an incentive and a disincentive to SLAB recovery. In terms of RCRA Subtitle C disincentives to metal recovery, secondary lead smelters recovering SLABs are subject to storage permit and LDR requirements for SLABs stored prior to reclamation. As stated previously, ABR estimates containment building retrofitting costs to avoid LDR storage prohibitions at $750,000 to $1 million per facility.[75] Also slag generated from the reclamation process is subject to LDR treatment standards for lead prior to disposal. ABR has indicated that treatment and disposal costs for lead slag to be $250 per ton.[76]

These RCRA Subtitle C compliance costs may act as a disincentive to additional secondary lead smelter capacity or capital investment in new projects. Others point out that the different regulatory provisions of RCRA itself are a disincentive to SLAB recovery since slag from primary lead smelting is not subject to Subtitle C regulation at the Federal level while slag from secondary lead smelting may be subject to Subtitle C regulation if it exhibits a characteristic (40 CFR §261.4(b)(7)(ii). RSR corporation in particular has asserted its belief that this is a harmful double standard. However, these actual and potential disincentives must be evaluated against those portions of RCRA Subtitle C regulation that serve to facilitate SLAB recovery and compliment state efforts to encourage this goal.

RCRA Subtitle C regulation may encourage SLAB recovery in two ways: 1) conditional exemption from Subtitle C regulation for SLAB waste handlers prior to arrival at a reclamation facility, and 2) LDR treatment standards specifying the thermal recovery of lead. First, as mentioned previously, SLAB being reclaimed are not subject to RCRA Subtitle C regulation prior arrival at a reclamation facility. Since this conditional exemption would not apply to SLAB being managed for Subtitle C treatment and disposal, the reduced shipping cost and collection cost for SLAB is an added incentive to manage these materials for recovery. Second, RCRA Subtitle C LDR requirements contain an important incentive for SLAB recovery. This is the LDR treatment standard for SLAB that specifies thermal recovery in secondary smelters for SLAB (40 CFR §268.42). This standard became effective in 1990 and precludes other forms treatment prior to land disposal of these materials.[77] This provides an important incentive for SLAB recovery by sustaining demand for secondary lead smelting. The LDR standard may be partially responsible for maintaining the high 1991 recovery rate in spite of a large decrease in the world price of lead.

In conclusion, RCRA Subtitle C appears to have mixed incentives and disincentives for SLAB recovery. <u>The weight of evidence suggests that RCRA Subtitle C regulation has not adversely affected SLAB recovery rates.</u> <u>It is probable that RCRA Subtitle C regulation has been a net incentive for SLAB recovery.</u> The increasing trend of SLAB recovery between 1985 and 1991 is largely due to increasing world prices for lead except for 1991. However, the sudden decrease in lead prices in 1991 due to the world recession and the stable high recovery rate for SLAB suggests that SLAB recovery may be to some extent insulated more now than in the past from the effects of the world price of lead. It is probable that state prohibitions on SLAB disposal in municipal landfills and RCRA Subtitle C incentives for SLAB recovery are the main factors causing the continued high recovery rate of SLAB.

Even if RCRA Subtitle C regulation does not adversely affect SLAB recovery, this does not mean that RCRA Subtitle C disincentives are not making that recovery less profitable for secondary lead smelters. RCRA Subtitle C compliance costs may be substantial. In 1990, the National Research Council (NRC) estimated that compliance costs for all federal environmental regulations average about 6 cents per pound of lead.[78]

NRC reports that these costs have contributed to a loss of competitiveness with the U.S. lead industry relative to foreign lead producers who are subject to less stringent environmental standards.[79] RCRA Subtitle C costs represent a portion of this total and may contribute to this loss of competitiveness.

On the other hand, it is important to assess the potential loss of competitiveness against the potential risk to human health and the environment from the mismanagement of SLAB. As mentioned in Chapter 3, SLAB recovery represents 50 percent of all Superfund and hazardous waste sites involving metal recovery identified in this report. Discarded battery casings and electrolyte (acid) have resulting in extensive contamination of surroundings areas including surface waters, soil and groundwater.
Regardless of whether current RCRA Subtitle C regulations are the most cost-effective management standards available, any proposed alternative set of management standards needs to be carefully evaluated prior to adoption to assure an environmentally protective outcome. As mentioned in Chapter 8, EPA has created the Definition of Solid Waste Task Force to help conduct this type of evaluation.

5.3.2 Industrial Sludges, By-Products and Spent Materials

Metal-bearing industrial sludges, by-products and spent materials include slag, sludge, and dust generated from the production of metals such as steel, copper and lead as well as metal finishing operations such as electroplating, etching and conversion coating. Many of these wastes are either listed hazardous wastes or exhibit a toxicity characteristic for one or more of the TC metals. As mentioned in Chapter 1, if a characteristic sludge or by-product is reclaimed, it is not a solid waste and therefore not subject to RCRA jurisdiction.

In contrast to SLAB, relatively little data is available on recovery of these materials, particularly related secondary materials that are exempt from RCRA reporting requirements. These industrial wastes are also different from SLAB in that their composition can vary widely with the type of raw material placed into the production process. Industrial sludges, by-products and spent materials can vary in terms of the percentage of a particular material that is technically amenable to recovery. Some streams such as K061 are almost completely amenable to recovery. Other materials such as F006 electroplating sludge may vary widely in its composition and degree of contamination (i.e., from grease, oil or other impurities).

The metal products recovered from these materials are most often concentrates and intermediate materials that require further processing before a pure metal is produced. Often, these industrial sludges, by-products and spent materials are recovered in the form of a metal oxide or salt (e.g., lead oxide, lead chloride, lead sulfate). As a general rule, the markets for these materials are lower value when compared with end uses for the metal form of the commodity.

Relatively few if any of these materials were managed for metal recovery before 1980. The GAO reported in 1980 that metals from these wastes were not being recovered because industry believed that there was simply no profit in it.[80] Fewer than 15,000 tons of metals were being recovered.[81] By way of comparison today, one facility, Inmetco, recovers more than that amount from K061, electric arc furnace dust, on an annual basis.[82] As a result, GAO estimated that roughly $3 billion of metal principally copper, iron and aluminum was being lost annually.[83]

According to industry data provided by trade associations and 1989 Biennial Reporting System (BRS) and summarized in Chapter 3, EPA estimates that there are over 1 million tons of industrial sludges, by-products and spent materials (not including SLAB) managed for metal recovery annually.[84] These materials include F006, wastewater treatment sludge from electroplating operations; K061, electric arc furnace dust; K062, spent pickle liquor from steel finishing operations; and characteristic spent materials such as copper etchants. In addition to these metal-bearing hazardous waste, there are other related metal-bearing secondary materials that are not considered hazardous wastes but are nonetheless managed for metal recovery largely as the result of RCRA Subtitle C regulation.

Related secondary materials such as characteristic sludges and by-products being reclaimed may be managed for metal recovery possibly as a result of the exclusion from the definition of solid waste and RCRA Subtitle C regulation. Examples of these materials include solder skimmings from electronic manufacturing and emission control dust from brass foundries. These examples are usually characteristically toxic for lead (D008) and would be considered hazardous wastes if abandoned, or applied to the land. Even though these materials are not considered solid wastes (and therefore hazardous wastes) when reclaimed, they should be considered in any estimate of metal recovery since these materials would be regulated as hazardous waste if discarded in a manner other than reclamation. Characteristic sludges and by-products being reclaimed may be managed for metal recovery to avoid RCRA Subtitle C treatment and disposal costs. In this sense, RCRA Subtitle C may serve as an incentive for metal recovery of materials that though they are not hazardous wastes are closely related.

Because these materials are exempt from RCRA reporting requirements, EPA does not have precise data on what quantities of these materials are managed for metal recovery. However, the most recent Toxic Release Inventory (TRI) data [85](1991) indicates that metal recovery of all metal-bearing secondary materials (including both hazardous wastes and related secondary materials) may be substantial. The data show that of all metal releases 65 percent are managed for recycling. The data also indicate that 82 percent of metals are transferred off-site are managed for recycling (the others are transferred for treatment, disposal, or discharge to a POTW).

The total quantity of metals transferred off-site for recycling is 1.012 billion pounds.[86] This total includes substantial quantities of copper, lead, zinc, nickel and chromium; metals commonly recovered from hazardous wastes. However, two caveats are in order regarding making an inference of TRI data on metal recovery of hazardous wastes and secondary materials. First, TRI data includes estimates of releases from other materials such as industrial Subtitle D, nonhazardous waste.[87] Second, the term "recycling" under TRI may include processes other than metal recovery such as use as an ingredient. Even though the data does not directly correlate with quantities of hazardous wastes and related secondary materials managed for metal recovery, it raises the inference that these quantities may be substantial.

The question raised by both the BRS/trade association data and the TRI data is what accounts for the increase in metal recovery of industrial sludges, by-products and spent materials between 1980 and 1993. The preceding discussion in Section 5.2 of hazardous waste treatment and disposal costs and U.S. metal prices suggests that these are substantial factors in causing the increase. RCRA Subtitle C has resulted in a substantial increase in treatment and disposal costs of metal-bearing hazardous wastes. In addition, RCRA Subtitle C regulation has created a series of incentives for managing hazardous wastes for metal recovery. Some of these incentives include:

- general exemption of the recycling process from regulation (40 CFR §261.6(c)),

- conditional exemption from Boiler and Industrial Furnace Subtitle C regulation for industrial furnaces burning solely for metal recovery (40 CFR §266.100),

- Land Disposal Restriction treatment standards specifying metal recovery for the following metal-bearing hazardous wastes: spent lead-acid batteries, nickel-cadmium batteries, high category mercury wastes (>260 mg/ml), K069 (emission control dust from secondary lead smelting), K106 (wastewater treatment sludge from the mercury cell process in chlorine production), and commercial chemical products (40 CFR §268.42),[88]

- exclusion from the definition of solid waste for characteristic sludges and by-products being reclaimed (40 CFR §261.2(c), while these materials are regulated as hazardous waste if disposed of,

- exemption from Subtitle C regulation for scrap metal being recycled, (40 CFR 261.6(a)(3)(iv),

- variance from the definition of solid waste for materials that are partially reclaimed but need to be reclaimed further (40 CFR §260.30(c)),

- generic delisting levels for nonwastewater residues from high temperature metal recovery (HTMR) of K061, K062 and F006 (40 CFR §261.3(c)(2)(ii)(C)(1)).

Although growth in world demand for copper, zinc, lead and nickel was slow during the early to mid-1980's, as mentioned above world metal demand began to increase around 1986. World consumption of copper, lead, nickel and zinc increased between 1985 and 1989 at an average rate of 3.2, 1.55, 3.8 and 2.1 percent per year respectively.[89] The increase in demand resulted in an average annual domestic increase in price between 1986 and 1990 of 10.6 percent for copper, 16.9 percent for lead, 25.9 percent for nickel (nickel prices spiked in 1988) and 11.1 percent for zinc.[90]

Although there is enough data to show that RCRA Subtitle C and the recent increase in world metal demand are probably the two main factors contributing to metal recovery of hazardous waste, due to data limitations it is not possible to make any conclusions about the relative strength of each factor. Irrespective of the relative contribution of RCRA Subtitle C and world metal markets to metal recovery of industrial sludges, by-products and spent materials, it is clear that incentives created by RCRA for recovery of these materials is substantial.

First, metal recovery has increased and remained stable during periods before and after the increase in metal prices from 1986 to 1990. Substantial amounts of metal recovery of Subtitle C hazardous waste were occurring in 1986 prior to the increase of metal demand.[91] Analysis completed for EPA by the Research Triangle Institute stated that a little more than 1 million tons of hazardous waste (including industrial waste and spent lead-acid batteries) was recovered.[92] This would indicate not only that RCRA Subtitle C apart from world metal demand is a substantial incentive for metal recovery of hazardous waste, but also that portions of RCRA Subtitle C program apart from the Land Disposal Restriction (LDR) treatment standards were contributing to that incentive since the latter were not in effect in 1986. Also, trade association data submitted to EPA by generators and reclaimers of metal-bearing hazardous waste indicate substantial quantities of listed industrial sludges such as F006 and K061[93] were recovered in 1992 relative to 1989 and 1990 when the world price of metals peaked out and began to decline due to world recession.

Second, many metal recovery operations derive 50 percent or more of their revenue from the user fees charged to generators of hazardous waste rather than the sale of recovered materials. This is particularly true for firms recovering the lower value base metal (i.e., copper, lead, zinc) concentrates and intermediates from hazardous wastes. One metal recovery firm representative indicated that the firm earned at least two-thirds of its revenues in user fees. This is not uncommon since the cost of processing often exceeds the revenue derived from the sale of the materials. Third, the relationship between RCRA Subtitle C treatment/disposal costs and metal recovery user fees is a more accurate indicator of an incentive than the relationship between world metal demand and revenue from the sales of recovered metal materials. RCRA Subtitle C treatment and disposal costs are direct substitutes for metal recovery user fees for generators. An increase or decrease in the tipping fees at a hazardous waste landfill or charge for stabilization can directly be related to what user fee can be charged by a metal recovery operation.

In contrast, world demand for metal commodities are not directly comparable to the price a metal recovery operation can charge for its recovered materials. As mentioned above, metals recovered from metal recovery operations are most often recovered in the form a concentrate or intermediate oxide or salt. These materials are usually partially reclaimed and the value added may be marginal compared with the value of the metal commodity. Even completely reclaimed materials from metal recovery operations may be limited to sale as scrap. If the end use markets to which these metals can be used are restricted to lower value markets, then the world price for the metal commodity will not be a accurate indicator for the degree of incentive realized by the owner/operator of a metal recovery operation. The fact that world metal demand is a less reliable indicator creates additional uncertainty relative to RCRA Subtitle C's effect on metal recovery of hazardous waste.

Finally, data in Table 5.2 above indicate that real U.S. metal prices were almost as high or higher for copper, lead, nickel and zinc between 1976 to 1980 than during the 1986 to 1990 period. Yet, as mentioned above, the GAO reported that little or no recovery of metal-bearing industrial waste occurred prior to 1980 because industry did not consider it profitable to do so. This suggests that since real U.S. metal prices are not higher in 1993 than they were before RCRA was enacted that higher user fees made possible by higher treatment and disposal cost are necessary (but not sufficient) to make metal recovery of hazardous waste profitable.

As with SLAB, the disincentives in RCRA Subtitle C regulation identified in Section 5.1 by the regulated community may constrain metal recovery of industrial sludges, by-products and spent materials to some extent and/or make such recovery less profitable. The derived-from rule storage permit requirements and facility wide corrective action are among the most serious disincentives cited previously.

Thus, while RCRA Subtitle C has had a net beneficial effect on metal recovery of these industrial wastes, it is also possible that several RCRA regulatory provisions are constraining metal recovery from hazardous waste from reaching its full potential. As with SLAB these provisions help to ensure that metal recovery that does occur is completed in an environmentally sound manner.

Any proposals to modify or eliminate RCRA regulatory provisions must be evaluated against the adequacy of the proposed alternative to avoid environmental mismanagement that has characterized certain metal recovery operations of the past. The mission of the Definition of Solid Waste Task Force created by EPA in 1992 is to help conduct such an evaluation.

In summary, there are substantial data limitations that inhibit assessment of RCRA Subtitle C regulation on metal recovery of industrial sludges, by-products and spent materials. Available information indicates that RCRA Subtitle C regulation has encouraged metal recovery of hazardous waste through increasing treatment and disposal costs and providing regulatory incentives for reclaimed materials. An increase in world metal demand beginning in 1986 has probably also contributed to the increase in metal recovery of hazardous wastes. Limited information suggests that RCRA Subtitle C has been a substantial incentive, particularly with firms that recover lower value base metal concentrates where revenues from their sale is low to begin with.

Finally, RCRA Subtitle C regulation may also constrain metal recovery of industrial wastes from reaching its potential. However, due to nonregulatory factors, EPA cannot predict whether reductions in Subtitle C compliance cost would significantly affect metal recovery rates of hazardous waste. And as mentioned above, any regulatory modifications must be evaluated carefully to ensure retention of environmentally protective management standards for metal recovery operations. EPA has created the Definition of Solid Waste Task Force to facilitate this evaluation.

5.4 Conclusion

Based on information reviewed in completion of this report, RCRA Subtitle C regulation has been and will continue to be a substantial factor encouraging environmentally sound metal recovery of hazardous wastes. There also appears to be room for improvement to provide additional incentive for environmentally sound metal recovery of hazardous waste. EPA is currently conducting a series of on-going activities to achieve this goal. These activities are discussed in Chapter 8 of this report.