ANALYSIS OF 40 POTENTIAL TSDS:

Potential RCRA Treatment, Storage, and Disposal Facilities
Proposed to the Superfund National Priority List after 1990

OFFICE OF SOLID WASTE

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The non-federally owned RCRA treatment, storage, and disposal (TSD) facilities that were proposed to Superfund's National Priority List (NPL) post-1990 are facilities that almost always had significant environmental problems prior to being subject to the RCRA hazardous waste management requirements. In most cases, these facilities had been significant industrial manufacturers since the early 1900s. When they entered the RCRA waste management program in the 1980s, these facilities already had widespread environmental contamination issues. The hazardous waste releases from RCRA regulated TSDs at these facilities were in almost every case insignificant when compared to the widespread contamination that was present at these facilities prior to the enactment of RCRA.

Background

Recommendations. In November 2003, the Environmental Protection Agency initiated a study of the Superfund program, commonly referred to as the "120 Day Study."[1] This "120 Day Study" resulted in more than 100 recommendations, two of which are related to the area of RCRA Financial Assurance. Recommendations 10 and 11 address TSD facilities subject to Subtitle C of RCRA, as well as hazardous waste generators, which are not subject to the financial assurance requirements of Parts 264 and 265.[2] Specifically, the study recommended:

Recommendation 10

> OSWER should evaluate the history of NPL listings and removal actions to determine what percent were RCRA treatment, storage, and disposal facilities or hazardous waste generators and to what extent these facilities present a continuing burden to the Superfund program.

Recommendation 11

> If the evaluation confirms a high correlation with RCRA-regulated facilities, OSWER and OECA [Office of Enforcement and Compliance Assurance] should

[1] *SUPERFUND: Building on the Past, Looking to the Future*, April 22, 2004.

[2] A third recommendation addresses financial assurance at non-RCRA sites. Recommendation 12 states, "For facilities not covered under RCRA, OSWER [Office of Solid Waste and Emergency Response] should study whether promulgating new regulations under CERCLA's broad financial assurance authorities could reduce the future needs of the Superfund program." OSWER is addressing this recommendation through a separate analysis.

examine different approaches to financial assurance under the RCRA program to reduce the likelihood of RCRA-regulated facilities becoming part of the future Superfund universe.

Prior Analysis. In order to address Recommendation 10 of the Superfund 120 Day Study, the Office of Solid Waste (OSW) performed ID matches of CERCLIS (EPA's Superfund database) sites to RCRAInfo (EPA's database of RCRA waste handlers) sites to determine how many RCRA TSDs and hazardous waste generators became CERCLA sites (both NPL sites and Non-NPL sites requiring Removal Actions). As RCRAInfo had no pre-existing, encompassing universe of facilities that had conducted TSD activities since the inception of the RCRA program, one needed to be created. In creating a list of facilities, OSW decided that being overly inclusive was better than potentially leaving off facilities that were, or had been, TSDs. Thus, OSW used a broad search strategy. Based on this strategy, OSW compiled a list of potential TSDs made up of all facilities that: (1) had been on the GPRA Permitting baseline, on the GPRA Post-Closure baseline, or in the Corrective Action Workload;[3] (2) had units which had been clean closed; (3) had units which had been referred to Superfund; or (4) had been included in the mutually agreed-upon Moore-Myers Superfund referrals list.[4] The result was a list of 6,992 potential TSDs. Because of the broad search strategy, this list includes facilities that were never RCRA TSDs, and it also includes facilities whose RCRA obligations have long since been satisfied. (See later discussion.)

Through the process of ID matching, 624 of these 6,992 potential TSD facilities were found to be listed in CERCLIS (both NPL sites and Non-NPL Removal sites), and 143 of that total were non-federally owned facilities that were either proposed to, listed as final on, or deleted from the NPL. The data analysis, undertaken during the summer of 2005, found that the 143 potential TSD facilities[5] make up 9% of the NPL universe of 1,587 sites (proposed, listed, or deleted). These 143 facilities account for $979 million (or approximately 10%) of the over $10 billion in CERCLA site-specific expenditures[6] at the 1,587 sites.[7, 8] While the data analysis indicated that only 2% (or 143) of the 6,992

[3] Currently, EPA believes that there are over 6,800 facilities potentially subject to RCRA Corrective Action statutory authorities. Of these, approximately 4,000 facilities are required to complete corrective action and are already implementing corrective action or will need to implement corrective action as part of the process to obtain a permit to treat, store, or dispose of hazardous waste. (These 4,000 facilities are the "Corrective Action Workload" referenced above.)

[4] This is a list of 155 High-ranked facilities in the Subject to Corrective Action Universe, not Listed on the FY 2008 Corrective Action baseline. These facilities were referred from RCRA Corrective Action to the Superfund program and proposed to, listed on, or deleted from the NPL.

[5] Because of the expansive criteria used in defining the potential TSD universe (as previously noted), not all of these 143 facilities turn out to be RCRA TSDs.

[6] Superfund site-specific expenditures pulled from the Agency's Integrated Financial Management System (IFMS) do not include indirect costs. As opposed to direct site-specific costs (resulting from activities such as such as site assessment, investigation, and cleanup), indirect costs cannot be attributed to any particular site and support the Superfund program as a whole. Examples of indirect costs are budget functions, human resources management, policy and planning functions, and support costs used to implement site-specific activities.

[7] Through the ID matches described earlier, EPA performed similar analyses to quantify the costs associated with hazardous waste generators proposed to, listed on, or deleted from the NPL, and with potential TSDs and hazardous waste generators that underwent Superfund Removal Actions (but were not

potential TSDs ended up proposed to, listed on, or deleted from the NPL, EPA recognized that it was important to understand why TSD facilities were being referred to Superfund (and eventually proposed for NPL listing) in order to provide insight into how financial assurance requirements had operated, and to determine whether any general lessons could be derived.

Design of Analysis of 40 Potential TSDs[9]

To better understand the circumstances surrounding the referral of RCRA TSDs to Superfund (specifically, those that were proposed to, listed on, or deleted from the NPL), OSW looked closely at the potential TSDs (as defined by the search strategy) that were proposed to the NPL after 1990. There were 40 potential RCRA TSDs[10, 11] within this category. OSW selected these 40 facilities for further investigation for two reasons. First, these facilities would be better predictors of the types of RCRA facilities which could be listed on the NPL in the future. By 1990, most of the significant 1984 HSWA regulations were promulgated; for this reason, the RCRA regulatory program governing listing of hazardous waste, financial assurance, and corrective action has changed little after 1990. Second, the Superfund deferral policy, which governs the types of RCRA facilities being proposed for Superfund NPL action, underwent several changes during the 1980s but has not changed significantly since 1990. Therefore, after 1990, policy changes in the RCRA regulatory program and the Superfund deferral policy could be eliminated as factors for RCRA TSDs being proposed to, or listed on, the NPL.

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proposed to the NPL). The percentage of all hazardous waste generators proposed to the NPL was 0.06%; however, Superfund costs at these sites accounted for 17% of site-specific expenditures at the 1,587 NPL sites. Potential TSDs represent 2% of all Non-NPL Removal sites (6% of total expenditures), while hazardous waste generators account for 5% of Non-NPL Removal sites (10% of total expenditures).

[8] Both of these expenditure figures were derived from information pulled directly from IFMS by the Office of Superfund Remediation and Technology Innovation (OSRTI) in May 2005, and include expenses reported through the end of FY 2004. The expenditure data cited here, and throughout the Analysis of 40 Potential TSDs, include agency-wide costs such as payroll and other intramural costs, but do not include special account, State-cost share, and other reimbursable account resources or indirect or other annual allocation resources.

[9] The Analysis of 40 Potential TSDs does not address TSDs or hazardous waste generators that underwent Removal Actions (as Non-NPL Superfund sites), or hazardous waste generators proposed to, listed on, or deleted from the NPL. The Superfund site-specific expenditures associated with potential former RCRA TSDs and hazardous waste generators that became Non-NPL Removal sites totaled $290 million (combined), while the expenditures associated with potential former TSDs and hazardous waste generators that were proposed to, listed on, or deleted from the NPL totaled $2.7 billion (combined). Given the magnitude of the cost differential, OSWER made a decision while responding to Recommendation 11 to focus on NPL sites, as opposed to Non-NPL sites which underwent Removal Actions. Furthermore, although this analysis does not address costs associated with former RCRA hazardous waste generators proposed to, listed on, or deleted from the NPL, these sites are being analyzed as part of the response to Recommendation 12 (which also examines contamination at non-RCRA NPL sites).

[10] These 40 facilities are a subset of the 143 potential TSDs referenced in the analysis above. Specifically, they are the subset of those 143 facilities that were proposed for listing on the NPL after 1990.

[11] Throughout this document, we generally refer to the group of facilities we are analyzing as the 40 potential RCRA TSDs, or simply the 40 facilities. Because of the expansive criteria used in defining the potential TSD universe (as previously noted), not all of these 40 facilities turn out to have been RCRA TSDs, and some operated (illegally) outside the regulatory framework.

For this analysis, OSW looked at the facility-specific characteristics of these 40 facilities to determine if there were any specific predictors for why these facilities were listed or proposed for listing on the NPL, and whether similar types of facilities would be proposed for listing on the NPL. OSW conducted its analysis of these 40 facilities in several phases. Initially, OSW conducted a series of preliminary conference calls with the Regions in order to gain information on these sites. OSW staff then pulled and analyzed data from detailed RCRAInfo permitting reports and researched NPL Site Descriptions, Regional NPL Fact Sheets, and information from other sources, such as Agency for Toxic Substances and Disease Registry (ATSDR) Public Health Assessments and court decisions. Individual site-specific summaries (*see* Attachment III) were prepared detailing and describing facility type, historical operations, waste management activities (including RCRA activities), permitting histories, specific hazardous waste units, remediation activities, Superfund expenditures, bankruptcy information, and cost recovery information, as well as relevant financial assurance data such as the mechanisms used, amounts assured, regulated units covered, and amounts drawn upon. Next, OSW requested (in several phases) that the Regions verify the specific details contained in these summaries and add in any additional information, where appropriate.[12] Included in this request was a list of questions to the Regions. While the Regions responded and provided essential details in many cases, the amount of information they were able to provide, and the extent to which they were able to answer the questions, in many instances, was limited by the historical nature of the information. OSW followed up with another series of Regional conference calls. The information gained from this process was then integrated back into the individual summaries. At the same time as this integration was taking place, an additional level of research and QA/QC was performed by OSW staff (using RCRAInfo reports and online information sources). The information from these 40 summaries was gathered together in a Summary Matrix (*see* Attachment II) and is used throughout this analysis. As was noted before, we used broad criteria for determining potential RCRA TSDs. As we examined the waste management history of these facilities, it became apparent that several of the 40 NPL sites were not RCRA-regulated TSDs or had marginal RCRA histories and we discuss this later in this analysis.

OSW examined the financial assurance status of the 40 facilities to assist in addressing Recommendation 11. Where information was available, OSW looked at financial assurance parameters to further inform the decision of whether changes in RCRA Financial Assurance requirements could reduce the likelihood of RCRA-regulated facilities becoming part of the future Superfund universe.

[12] *See* Attachment I: Memorandum: Request for Facility-Specific Information to Support Financial Assurance Analysis. (This memorandum was the first of three phases in OSW's multi-phased request to the Regions. Similar memos were sent to the rest of the Regions that had facilities in the group of 40.)

Summary Results

Legacy Contamination. This analysis examines the reasons for Superfund expenditures at the 40 potential RCRA TSD facilities that have been proposed to the NPL over the past 15 years (including those facilities subsequently listed as final or deleted). Although these 40 facilities were proposed for listing on the NPL after 1990, the great majority of contamination at these facilities, in most cases, occurred many years beforehand.[13] Thus, their environmental problems predated the RCRA hazardous waste regulatory program, including the financial assurance obligations.

Through the Hazardous and Solid Waste Amendments of 1984, Congress mandated that persons seeking RCRA permits address contamination from past waste management activities at their facilities. Owners and/or operators of RCRA TSDs are required to implement corrective action for all hazardous and solid waste management units at their facilities. The RCRA Corrective Action program has been successful in controlling unacceptable human exposures and stabilizing groundwater contamination at most of the more complex contaminated sites. Specifically, by the end of fiscal year 2005, human exposures had been controlled at 96% of the facilities on the Corrective Action Baseline,[14] and groundwater contamination had been stabilized at 78% of these facilities.

Superfund Referrals. While EPA has adopted a policy of addressing RCRA facilities first under RCRA Corrective Action authorities, some RCRA TSDs have been referred to the Superfund program. If the owners and/or operators of RCRA facilities are financially unable or are unwilling to conduct corrective action, then these facilities are prime candidates to be addressed under the Superfund program. The Superfund NPL listing policy, formalized in the early 1990s, addressed these two specific situations as appropriate conditions under which RCRA facilities would be cleaned up under Superfund. This policy has been largely unchanged for the past 15 years. Of the 40 facilities examined in this analysis, 28 of them were bankrupt, and therefore were unable to complete RCRA Corrective Action. A number of facilities were also unwilling to conduct RCRA Corrective Action. It is not clear from historical information the exact number of sites in this "unwilling" category. In any case, the analysis indicated that a number of facilities failed to comply with EPA or State directions to clean up past contamination, and EPA sought recourse to Superfund authority.

Lag Period Between End of Operations and NPL Proposal. In many cases, facility operations ended well before the sites were proposed for NPL listing. About half of the 40 facilities ceased operating prior to 1990. On average, for those facilities which ceased

[13] Of the 40 potential RCRA TSDs analyzed, 32 of them were clear cases where legacy contamination was the major constituent of the environmental damage present at those sites. Two facilities were clear cases where the majority of the contamination cannot be considered "legacy." At the other six facilities, it is not clear whether the majority of waste was due to legacy contamination.

[14] EPA developed the RCRA Corrective Action Baseline in conjunction with the States as a result of a mandate in the Government Performance & Results Act (GPRA) requiring EPA to measure and track program progress toward achieving clearly defined results. There are over 1,700 facilities on the FY 2005 RCRA Corrective Action Baseline.

operations (or terminated the operations that resulted in the environmental damage), there is approximately an eight-year delay between facility shutdown and NPL proposal.[15]

Non-Notifiers. Six of the 40 facilities investigated never notified EPA that they were managing hazardous waste. These were National Southwire, American Brass, Jasper Creosoting, Jennison-Wright, Pacific Sound Resources (PSR), and Taylor Lumber. Four of these six facilities were wood treating operations. Two facilities (National Southwire and Pacific Sound Resources) may not have been engaged in activities requiring notification; see later discussion on "Non-TSDs and Marginal RCRA Histories." The majority of the wastes and/or waste management processes at these six operations were discovered during the 1980s and early 1990s.

Federal and State authorities took significant action against four of the non-notifiers for managing hazardous waste without a RCRA permit or Interim Status. At one facility (PSR), officials pleaded guilty to violations of RCRA in 1985. At another facility (Jasper Creosoting), the Texas Attorney General's Office in 1986 filed a Plaintiff's Original Petition. At a third (American Brass), EPA and State authorities took several enforcement actions from 1986 until operations ceased in 1992, for RCRA violations, including the disposal of hazardous waste without a permit. Finally, starting in 1993, EPA issued several complaints under RCRA 3008 against Taylor Lumber for its failure to obtain a permit and provide financial assurance. In 1995, EPA issued a 3008(h) order, requiring site-wide corrective action (including provisions for financial assurance) at the facility. Taylor had always been a marginally viable operation; EPA was made aware of this (during the mid-1990s, Region 10 received and reviewed information on Taylor's financial status and ability to pay). For this reason, EPA withdrew its 3008 complaint in 1999 in order to provide the owner/operator a chance to focus its efforts and limited financial resources on addressing the environmental problems at the facility, as opposed to tying that money up in a financial assurance mechanism. In this manner, Taylor performed a Potentially Responsible Party (PRP)-led Removal Action (initiated in 1999, completed in 2000) before it went bankrupt in 2001. (No record of federal or State action against either of the two other facilities, National Southwire and Jennison-Wright, could be found.) As the description above indicates, these facilities from the beginning were unwilling or unable to comply with RCRA Subtitle C requirements as they existed at the time. In these cases, the RCRA requirements appear to have worked as intended: they forced marginal and/or uncooperative facilities to shut down as hazardous waste operations.

Illegal Waste Management and Non-Compliance. Aside from those facilities which never notified they were treating, storing, or disposing of hazardous wastes, at least another twelve facilities were engaging in illegal waste management practices. Significant environmental damage at several facilities (Escambia Wood,

[15] A few facilities are still active; however, some of these are no longer conducting the operations which caused the environmental damage, and others which are currently active are now conducting operations unrelated to the former (and, in one case, separate) waste disposal sites which were the grounds for NPL proposal. In cases such as these, the end-of-operation dates used were those at which the waste management practices that caused the environmental damage came to an end.

Petrochem/Ekotek, Omega Chemical, Alabama Plating, and LCP Chemicals, GA) resulted from improper and illegal waste disposal practices (in violation of permits at certain facilities where permits were in place). One facility (Petrochem/Ekotek) was issued repeated Notices of Violation by its State agency for permit violations, while another facility (Alabama Plating) illegally disposed of galvanizing wastes in sinkholes on the facility's property. At one of the facilities (LCP Chemicals, GA), the owner/operator illegally disposed of chemical manufacturing wastes in surface impoundments. Several LCP executives were convicted of conspiring to violate RCRA, CERCLA, and the Clean Water Act. The former chairman of the board for the parent firm was ordered to serve nine years in prison, the longest sentence handed down for environmental crimes.

Two of these twelve facilities were the subject of EPA or State actions, and subsequently refused to comply with the conditions set out by regulatory agencies. One of these (Cam-Or) never submitted its Part B application or provided financial assurance. After a consent agreement and final order in 1986, the owners agreed to close the facility; however, Cam-Or voluntarily liquidated its assets in order to avoid closure and cleanup obligations. As a result of an enforcement order, another facility (Hart Creosoting) was required to submit a revised permit application and compliance plan. Although the State agency received a revised Part B from the facility (which stated that closure/post-closure financial assurance had been procured), no financial assurance mechanisms were ever actually submitted or put in place. As with non-notifiers, the situations described in this section are indicative of compliance issues, as opposed to regulatory issues.

Financial Assurance Information. As part of the request to the Regions for facility-specific information, OSW asked a series of questions regarding the financial assurance status of these 40 facilities. Some of these questions were:[16]

- Was there financial assurance in place for the regulated units?
- What type of mechanism was used and which units were covered?
- For a facility using the financial test, was it passing the financial test at the time of NPL proposal?
- How much (if any) of the financial assurance money has been collected and used for closure/post-closure or Corrective Action activities by the State?
- Was there financial assurance for Corrective Action at Solid Waste Management Units?

OSW received relatively limited information in response, largely because the questions dealt with events taking place many years in the past. Many of the facilities ceased operations during the late 1980s and early 1990s, and a number of them, as indicated above, never had financial assurance. Given the age of the permit files, this is understandable.

[16] *See* Attachment I.

In spite of the difficultly in analyzing this financial assurance information, several trends are apparent. There were several instances where facilities converted to generator-only status and financial assurance was no longer required. There were other cases where facilities either were non-notifiers that never complied with RCRA (National Southwire and Pacific Sound Resources) or in fact were never RCRA TSDs (Sharon Steel Farrell Works Disposal Area). Furthermore, there were several instances where the required financial assurance (for closure/post-closure and for corrective action) was not provided by the facilities or was provided at an inadequate level, either because the facilities were recalcitrant or were unable to comply. This, therefore, does not point towards a failure of the financial assurance regulations.

As described above, the available financial assurance information does not point to problems in the financial assurance regulations or the basic approaches EPA or the States took to implementing them.

Costs. As a result of the prior data analysis mentioned above, OSW determined that the Superfund site-specific expenditures at these 40 facilities totaled $425 million. This figure is derived from expenditure information in IFMS. Many of these facilities will require future Fund expenditures; however, the amount of those expenditures is unknown. At several of these facilities, however, PRPs are funding much (or all) of the cleanup cost. (See later section for discussion on cost recovery at these facilities.) The numbers taken from IFMS do not include indirect costs at these Superfund sites, which have been reported to run between 30% and 50% of direct costs.[17]

Geographic Distribution. Most of the facilities are located in the South, including Texas. Twenty-three of the 40 potential TSDs (or 58%) were located in EPA Regions 4 and 6. However, over one-third of the $425 million in CERCLA funds expended at these 40 sites was spent remediating wastes at two megasites in Region 1, Raymark and GE Housatonic (combined expenditures of $162 million). A specific breakdown by Region, including Superfund expenditures, is as follows:

[17] These indirect cost estimates are based on communications with Office of Site Remediation Enforcement (OSRE) staff.

	Facilities	Expenditures	% of Total Expenditures
Region 1	3	$165,326,592	38.9%
Region 2	2	$4,557,055	1.1%
Region 3	1	$3,347,911	0.8%
Region 4	11	$84,490,901	19.9%
Region 5	4	$5,813,168	1.4%
Region 6	12	$102,617,709	24.1%
Region 7	0	$0	0%
Region 8	2	$7,293,666	1.7%
Region 9	3	$44,600,140	10.5%
Region 10	2	$7,074,010	1.7%
Total	40	$425,121,153	100%

The numbers reported in the above table reflect end of fiscal year 2004 IFMS expenditure figures, which were the most up-to-date numbers available at the time the analysis was initiated. Information reflecting costs reported through fiscal year 2005 is currently available, which shows minimal rises (less than 8%, overall) in expenses at these 40 NPL sites.

Cost Recovery. Approximately 42% of the overall costs incurred by Superfund at these 40 sites has been recouped via cost recovery.[18] The Superfund statute provides the authority for the federal government to recover what it spent on cleanup activities. When EPA does the cleanup work using Superfund money, it generally tries to recover those costs from responsible parties.[19] Although $425 million has been spent, Superfund has recovered at least $177 million via judgments, settlements, and consent decrees (with an additional $18 million in proposed settlements).[20, 21] Cost recovery figures have been

[18] It should be noted that Superfund cost recovery is not a replacement for effective RCRA Financial Assurance requirements. However, Superfund is an important backstop for RCRA in situations where owners/operators are financially unable or unwilling to conduct corrective action. It is clearly appropriate to consider cost recovery when quantifying the costs associated with RCRA facilities being addressed by Superfund.

[19] If a potentially responsible party is unwilling to pay for cleanup, the federal government may take action and later seek to recover from the PRP the cost of the response. Also, if financially capable PRPs cannot be identified within a reasonable time to address an imminent and substantial endangerment, the federal government may initiate cleanup activities and later seek to recover the cost of the activities from one or more responsible parties identified later in the process.

[20] In certain cases, the analysis does not specify from whom EPA recovered costs. Although costs were recovered in many cases from the RCRA facility owners/operators, some costs were recovered from generators or pre-RCRA site owners. Given the findings that a great majority of the contamination at the 40 sites was historical legacy contamination, recovering costs from prior owners/operators may indeed be appropriate from an equitability standpoint. Quantifying the equitability of the cost recovery was not part of this analysis.

[21] An additional $36 million was collected from GE to reimburse EPA for remediation work performed at the Housatonic River site. For financial tracking purposes, a separate site identifier (still under the same CERCLIS ID) was set up for a 1.5 mile stretch of the river whose cleanup work is being funded by a

included where available. Some of the Regions were not able to provide information, while others indicated that there were several sites at which cost recovery negotiations were still ongoing. The actual amount of money recovered may indeed be higher as a result of possible additional funds recovered, but not reported, as well as continuing settlements. Amounts are also subject to increase based on future settlements with PRPs. Besides EPA and State authorized environmental agencies, other public entities have also received significant compensation and reimbursement for administrative costs and cleanup work performed at several of these sites (over $20 million in funds and assets). Additionally, PRPs are already funding much of the cleanup at some of the 40 sites (such as Casmalia), and agreements are in place for PRPs to finance all future cleanup work at certain other sites (Alcoa).

Non-TSDs and Marginal RCRA Histories. As discussed earlier, a number of the 40 facilities reviewed in this analysis operated outside the RCRA regulatory structure. Six were non-notifiers, and another twelve were involved in illegal waste management activities. In addition, one facility (Sharon Steel Farrell Works Disposal Area) was clearly not a TSD, even though it was reported in our data search. Thus, nearly half of the 40 sites reviewed in this analysis were illegal operators or marginal RCRA facilities (or in the case of one facility, not a TSD).

The operating plant for Sharon Steel was a legitimate RCRA TSD, with an EPA ID number. However, the NPL site consists of a non-contiguous dumpsite area where Sharon Steel disposed of slag and other wastes. This dumpsite was placed on the NPL in order to provide parties interested in mining the slag some comfort that they would not become PRPs. (The operating plant itself is being addressed separately under the oversight of PADEP. The current owner and operator of the manufacturing facility, Caparo Steel Company, entered into a consent order and agreement with PADEP in 1994 to eliminate all imminent and substantial threats to public health and the environment posed by the facility. The disposal area showed up on the list of 40 because it was given the same EPA ID as the former operating plant, and this list was created by ID matches of CERCLIS sites to RCRAInfo sites, as described above.)

At another one of the 40 sites (GE Housatonic), the principal source of contamination was polychlorinated biphenyls (PCBs), which are not directly regulated under RCRA, but fell under corrective action requirements only because of other, unrelated activities at the site. (In addition, EPA's decision to address contamination at the GE Housatonic site under CERCLA does not reflect a problem with financial assurance.)

Additionally, there are other sites where the regulatory status of the facility is unknown since the early RCRA history was not accurately contained in RCRAInfo. Therefore, of the 40 sites, one of them (Sharon Steel Farrell Works Disposal Area) is clearly not a former TSD, while the RCRA status of two of them (National Southwire and Pacific

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special account. The additional $36 million in cost recovery was collected from GE to reimburse EPA for cleanup activities funded by this special account. Since the Superfund site-specific expenditures pulled from IFMS do not contain special account money (as noted earlier), this $36 million was not included in the $177 million cost recovery figure noted above.

Sound Resources) is unknown. (We view these two sites as marginal because we were not able to confirm the nature of their RCRA activities from the available data, but in the case of PSR, for example, the facility was subject to RCRA enforcement action.)

Analysis of the Specific Groups

The 40 potential RCRA TSD facilities can be categorized into six major groups according to the type of operations conducted:

2 facilities were Commercial Waste Management operations: Aqua-Tech Environmental, Inc. (Groce Labs), SC; and Casmalia Resources, CA;

14 facilities were Wood Treatment operations: Escambia Wood, FL; Brunswick Wood Preserving, GA; Camilla Wood Preserving, GA; Picayune Wood Treating, MS; Jennison-Wright, IL; Popile, AR; Jasper Creosoting, TX; Mountain Pine Pressure Treating, AR; Hart Creosoting, TX; Garland Creosoting, TX; Marion Pressure Treating, LA; McCormick & Baxter Creosoting, CA; Pacific Sound Resources, WA; and Taylor Lumber and Treating, OR;

10 facilities were Metal Smelting operations: Sharon Steel (Farrell Works Disposal Area), PA; National Southwire Aluminum, KY; Ross Metals, TN; American Brass, AL; Macalloy, SC; US Smelter and Lead Refinery, IN; National Zinc, OK; RSR, TX; Delatte Metals, LA; and Asarco (Globe Plant), CO;

5 facilities were Chemical Manufacturing operations: LCP Chemicals, NJ; Diaz Chemical, NY; LCP Chemicals, GA; Alcoa (Point Comfort)/Lavaca Bay,[22] TX; and Omega Chemical, CA;

4 facilities were Oil Refinery operations: CAM-OR, IN; Indian Refinery – Texaco Lawrenceville, IL; Hudson Refinery, OK; and Petrochem Recycling (Ekotek Plant), UT;

5 facilities were Other Manufacturing operations: Raymark Industries, CT; GE (Housatonic), MA; Nuclear Metals, MA; Alabama Plating, AL; Rockwool Industries, TX.

[22] Although Alcoa began operations as an aluminum smelter in 1948, and further continued to refine bauxite ore into alumina as its central continuing business operation, the major sources of contamination at the Lavaca Bay site (mercury and polycyclic aromatic hydrocarbons (PAHs)) resulted from on-site chemical manufacturing activities. (This included the production of chlorine gas, sodium hydroxide, electrode binder pitch, and creosote.) For this reason, the Alcoa site has been placed in the Chemical Manufacturing section.

Wood treatment and metal smelting operations, which combined to make up over half of the overall universe, were generally located in Regions 4 and 6. All of the TSDs from Region 1 were other manufacturing operations. Many of the sites in the other groups (such as chemical manufacturing) were distributed across the country. The following table breaks the six major groupings down by Region:

	Regions										
	1	2	3	4	5	6	7	8	9	10	**Total**
Commercial Waste Mgmt.	-	-	-	1	-	-	-	-	1	-	2
Wood Treatment	-	-	-	4	1	6	-	-	1	2	14
Metal Smelting	-	-	1	4	1	3	-	1	-	-	10
Chemical Manufacturing	-	2	-	1	-	1	-	-	1	-	5
Oil Refinery	-	-	-	-	2	1	-	1	-	-	4
Other Manufacturing	3	-	-	1	-	1	-	-	-	-	5
Total	3	2	1	11	4	12	0	2	3	2	40

The overall Superfund site-specific expenditures used for remediation activities at these 40 facilities totaled $425 million. Although the average expenditures exceeded $10 million per site, the average Superfund costs of the 38 facilities, excluding the two megasites in Region 1, were just under $7 million per site. Other manufacturing sites accounted for the highest level of Superfund expenses, but this was largely due to GE and Raymark. Also, Casmalia accounted for most of the money spent on commercial waste management sites. Chemical manufacturing sites had the fewest Superfund dollars expended on a per-site basis, at under $4 million per site. The table below sums and averages the Superfund expenditures for the facilities in each of the six groups:

	Facilities	Superfund Expenditures	% of Total Expenditures	Average Expenditures
Commercial Waste Management	2	$22,826,347	5.4%	$11,413,174
Wood Treatment	14	$106,652,567	25.1%	$7,618,041
Metal Smelting	10	$79,834,835	18.8%	$7,983,484
Chemical Manufacturing	5	$18,852,499	4.4%	$3,770,500
Oil Refinery	4	$20,574,698	4.8%	$5,143,675
Other Manufacturing	5	$176,380,207	41.5%	$35,276,041 [23]
Total	40	$425,121,153	100%	$10,628,029 [23]

[23] It must be noted here that the two megasites (GE and Raymark) significantly skew the average expenditures figures. Excluding these two sites, the average amount of CERCLA expenditures at the remaining three Other Manufacturing sites is $4,836,746. Excluding the two megasites, the average amount of CERCLA expenditures at each of the remaining 38 facilities in the entire universe of sites is $6,927,663.

Commercial Waste Management

Of the 40 potential RCRA TSD facilities that were proposed for listing after 1990, two facilities (Aqua-Tech and Casmalia) were involved in commercial waste management. This is a relatively small number of facilities, compared to generators of hazardous waste that managed on-site (e.g., wood treaters, metal smelters). Both of these facilities operated under RCRA Interim Status standards. Because of numerous RCRA violations, neither of these facilities was ever issued a RCRA operating permit. These two facilities had long histories of mismanagement of hazardous waste, and the combined effect of RCRA regulations was to shut down their operations. Each facility had interim status terminated in 1991, and each was referred to CERCLA for closure and cleanup at that time. Aqua-Tech and Casmalia were facilities with numerous RCRA violations, with owners/operators unwilling to comply with RCRA requirements. Under the CERCLA deferral policy, these facilities were referred from RCRA to CERCLA for cleanup (*see* EPA 540-R-95-002g; 1995).

Aqua-Tech Environmental Inc., SC, is a closed RCRA treatment, storage, and disposal facility. From approximately 1940 until 1968, the property was used as a municipal solid waste landfill. Beginning in 1974, a hazardous waste treatment, storage, and reclamation facility was operated over the former landfill site. Starting in 1981, the facility operated under RCRA Interim Status. After several complaints, RCRA inspection violations, and on-site accidents, the facility was ordered to close. In 1991, a final permit decision was issued, and an operating permit for all of the waste management operations was denied. Interim status for the facility was terminated, and the facility was referred to CERCLA for closure/post-closure/cleanup activities (due to bankruptcy). Although Superfund has

spent $1.9 million remediating Aqua-Tech, over $1.7 million of cleanup costs have been recovered.

Casmalia Resources Hazardous Waste Management Facility, CA, is a closed commercial RCRA hazardous waste disposal facility. Between 1973 and 1989, the facility accepted more than 5.6 billion pounds of industrial and commercial waste, which included organic sludges, pesticides, solvents, acids, metals, caustics, cyanide, and polychlorinated biphenyls (PCBs). More than 10,000 companies and government entities sent waste to Casmalia during this period. Beginning in 1981, the facility operated under RCRA Interim Status. In 1989, facing multiple regulatory enforcement actions, the site stopped taking shipments of waste material. In 1991, the owners and operators abandoned efforts to properly close and clean up the site, claiming financial difficulties. California terminated work on the facility's permit and EPA terminated interim status. Casmalia had $12 million in a trust fund for site closure, and this money was used to begin remedial cleanup activities. Although the current estimate for cleaning up the site is $271.9 million, a total of $162.4 million of this (with an additional $18.1 million in proposed settlements) has been recovered from, or is being funded by, PRPs.

Wood Treatment

The 14 wood treatment facilities in this analysis had similar histories of operation. Most started in the early- to mid-1900s. They initially used coal tar derived creosote as the wood preservative. They treated wood products by submerging them in ponds containing a mixture of creosote and diesel fuel. By the 1970s, most of the wood treatment facilities switched from creosote to pentachlorophenol as the wood treatment chemical. Large pressure vessels were used to apply the pentachlorophenol mixture to the wood products. In the 1980s, if the facilities were still in operation, they switched to chromium copper arsenate (CCA) as the wood treatment chemical. Similar to the pentachlorophenol treatment, large pressure vessels were used to apply the CCA mixture.

At these wood treatment facilities, the vast majority of the wastes were generated and disposed of (either on- or off-site), prior to the waste being regulated under RCRA Subtitle C. Operations at some of these facilities started in the early 1900s, and some of the facilities had active waste disposal operations 50 years prior to the enactment of the RCRA hazardous waste management requirements.

About half of the wood treatment facilities notified in 1980 that they were conducting activities requiring a RCRA permit. Some of the other facilities notified at later dates, while four facilities never notified they were managing hazardous waste. In the early 1980s, wood treatment operations usually involved hazardous waste storage and treatment of listed wood treatment sludge (K001). In 1990, EPA updated its hazardous waste listing for certain wood treatment wastes. Wastes from the use of creosote (F034), pentachlorophenol (F032), and copper, chromium, arsenic (F035) wood treatment processes were specifically listed as hazardous wastes.

In 1985, RCRA TSD facilities had to certify that they had financial assurance and adequate groundwater monitoring systems or they lost interim status. A number of the wood treatment facilities closed at that time. In 1988, RCRA TSD facilities with surface impoundments had to either retrofit the impoundments with liners and leachate collection systems or close. Since many of the wood treatment facilities used storage/treatment surface impoundments, many wood treatment facilities decided to close their impoundments rather than retrofit them. Drip pads at wood treatment facilities became subject to RCRA regulations in 1990. These drip pad regulations were amended in 1992. In order to comply with regulatory requirements, drip pads must be designed to prevent waste migration by either having an appropriate surface coating or liner/leachate collection system.

The progression of new hazardous waste requirements with ever-increasing protection (financial assurance certification, groundwater monitoring certification, corrective action for past activities, surface impoundment requirements, and additional hazardous waste listing) contributed to many of the wood treatment facilities closing.

Metal Smelting

The metal smelting operations at the 10 facilities listed above started as early as the 1880s. Four of these facilities began operations before 1910, and all started operations prior to the implementation of the RCRA regulations. The smelting operations varied from primary ore smelting to secondary smelting of lead and brass.

The primary smelting operations included lead, zinc, copper, steel, aluminum, cadmium, gold, silver, thallium, and vanadium production operations. These smelting operations resulted in large amounts (millions of tons) of slag waste which were usually disposed of at or near the facilities. At one facility (Sharon Steel), millions of gallons of spent pickle liquor acid were dumped over the slag at the off-site disposal area until 1981; this resulted in significant groundwater contamination (metals). At another facility (National Southwire Aluminum), aluminum pot liners, calcium fluoride slurry from the air pollution control system, and refractory bricks were disposed of on-site in unlined surface impoundments and a disposal area. The smelting operations at another facility (Macalloy) generated 80,000 tons of chromium-containing wastes. At some of the primary smelting facilities, off-site airborne contamination occurred during early operations, prior to the installation of air emission control technologies. This airborne contamination resulted in neighboring soil contamination.

Secondary smelting operations in many cases involved lead battery recycling operations (4 out of the 5 facilities which conducted secondary smelting operations utilized spent lead-acid batteries as input into the smelting operation). The batteries were cut open and the lead plates were removed and smelted. Wastes included large amounts of blast furnace slag, acid waste waters, sludge, and plastic battery cases, which in many cases were disposed of on-site in surface impoundments and waste piles. Lead contamination of neighboring properties also occurred due to airborne transport of contaminants.

At these metal smelting facilities, the vast majority of the wastes were generated and disposed of (be it on- or off-site), prior to the waste being regulated under Subtitle C of RCRA. Operations at some of these facilities started in the late 1800s or early 1900s, and some of the facilities had active waste disposal operations 50 to 100 years prior to the enactment of the RCRA hazardous waste management requirements.

Chemical Manufacturing

The chemical manufacturing activities at the five facilities listed above started as early as 1903. A variety of chemicals were produced at these facilities, including: chlorine (through a mercury cell electrolysis process), sodium hydroxide, hydrochloric acid (HCL), anhydrous HCL, caustic soda, electrode binder pitch, creosote, halogenated aromatic compounds, organic solvents, and organic chemicals for the pharmaceutical, agricultural, photographic, color and dye, and personal care industries.

Early waste management practices at these facilities were rather rudimentary. In some cases, waste streams were diverted off-site into adjoining wetland areas or rivers. At the majority of these chemical manufacturing facilities, waste management started at least 50 years prior to the enactment of the RCRA hazardous waste management requirements.

Oil Refining

The refinery operations at the four facilities listed above started as early as the late 1800s. Two of the facilities were involved with refining crude oil, while the other two facilities were re-refiners of used oils. The principle products of these refinery operations were: liquid petroleum gas, motor gasoline, aviation gasoline, jet fuel, burner oil, diesel oil, home heating oil, fuel oil, lube oil, and asphalt materials.

The facilities operated for many years prior to the implementation of the RCRA hazardous waste regulations. Much of the waste present at these facilities is historical in nature, with a large percentage deposited before the Subtitle C regulations took effect. Waste management activities included storing waste in piles on-site, storing it in aboveground and in-ground tanks, disposing of wastes in retention ponds, lagoons, surface impoundments, and tar pits, and treating wastes in bio-treatment ponds and treatment units. The long history of pre-1980 unregulated waste disposal at these refinery operations led to widespread contamination at these facilities.

Other Manufacturing

Five of the facilities were involved with various other manufacturing activities that started as early as 1919. These facilities' operations included manufacturing asbestos-containing automotive products, manufacturing transformers (using PCBs), munitions,

and plastics, fabricating nuclear and specialty metals, electroplating and hot-dip galvanizing, and manufacturing mineral wool insulation. These manufacturing operations resulted in widespread on- and off-site contamination which occurred prior to the implementation of the RCRA hazardous waste regulations. Wastes were disposed of in waste piles, off-site wetlands and rivers, and on-site surface impoundments, as well as also being used as fill material for on- and off-site areas.

On-site surface impoundments that were used for waste disposal at three of these facilities lost interim status in 1985 and were forced to close. The unregulated waste disposal activities prior to RCRA at these manufacturing operations led to the widespread contamination of the facilities.

Through the Superfund cost recovery process, EPA and State agencies have recouped significant amounts of money from PRPs. At the GE Housatonic site, over $45 million of the $53 million spent on remediation has been recovered, with an additional $36 million recovered from work funded from a special account. At Raymark, the Superfund program has recovered $20 million of the $108 million spent on remediating the site so far; additionally, $6 million has been recovered by Connecticut from State funds used for conducting cleanup activities.

Main Findings

- Most of these 40 potential RCRA TSD facilities can be classified as "legacy facilities." That is, most of the environmental damage present at these sites generally occurred before the RCRA hazardous waste regulations were promulgated and began to regulate TSD activities.
- A significant number of facilities were marginally capitalized, especially in comparison to many decades of environmental contamination. The fourteen wood treatment facilities, for example, fit into this category, as do the ten metal smelting operations. Many of these facilities were in economic sectors experiencing a considerable amount of difficulty in the 1980s and 1990s (for example, wood treatment and metal operations).
- Cleanup activities at these sites were generally not associated with failure of RCRA regulated TSD units. Corrective Action obligations stemming from RCRA regulated activities were usually relatively minor compared to the massive cleanups caused by pre-RCRA historical waste generation and disposal.
- Of the $425 million Superfund has spent remediating these 40 sites, over one-third of that amount ($162 million) was expended at two sites. Through the cost recovery process, Superfund has recouped $177 million so far of the funds spent on cleanup activities at these 40 sites. Additionally, PRPs are funding much (or all) of the remediation at several of these sites.
- Six of the 40 facilities never notified that they were managing hazardous waste. Additionally, at least twelve others engaged in illegal waste management practices (and one other was not a RCRA TSD at all). These facilities therefore

operated outside the RCRA regulatory regime and were generally subject to enforcement actions before referral to CERCLA.

- A significant number of these facilities ceased operations, or ceased waste management activities, because they were unable to comply with RCRA hazardous waste requirements, including financial assurance requirements.
- EPA followed its RCRA deferral policy; that is, the facilities referred to Superfund appeared to be unwilling or unable to comply with the RCRA hazardous waste management requirements.

Conclusions

This analysis shows that the proposed listing of these 40 potential RCRA TSDs on the NPL was not due to a failure of the RCRA hazardous waste regulatory program, be it the financial assurance requirements or some other technical waste management standard. Rather, the analysis shows that the RCRA hazardous waste management requirements generally worked the way they were designed. Marginal RCRA TSD facilities were forced to cease operations as environmentally protective RCRA requirements were promulgated, and as these facilities were increasingly unable to comply with the protective standards and the RCRA Corrective Action requirements.

Given this information, EPA is not undertaking further analysis of RCRA TSDs on the NPL under Recommendation 11. EPA, however, recognizes that NPL listings are not the sole issue. EPA is now assessing whether to undertake changes to the RCRA Financial Assurance regulations and guidance based on recommendations of the IG, GAO, and the EFAB. This effort is proceeding on a separate track, and will provide useful information to EPA in evaluating the RCRA Financial Assurance regulations.