

530K94003



Review of Industrial Waste Exchanges

ACKNOWLEDGEMENTS

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CONTENTS

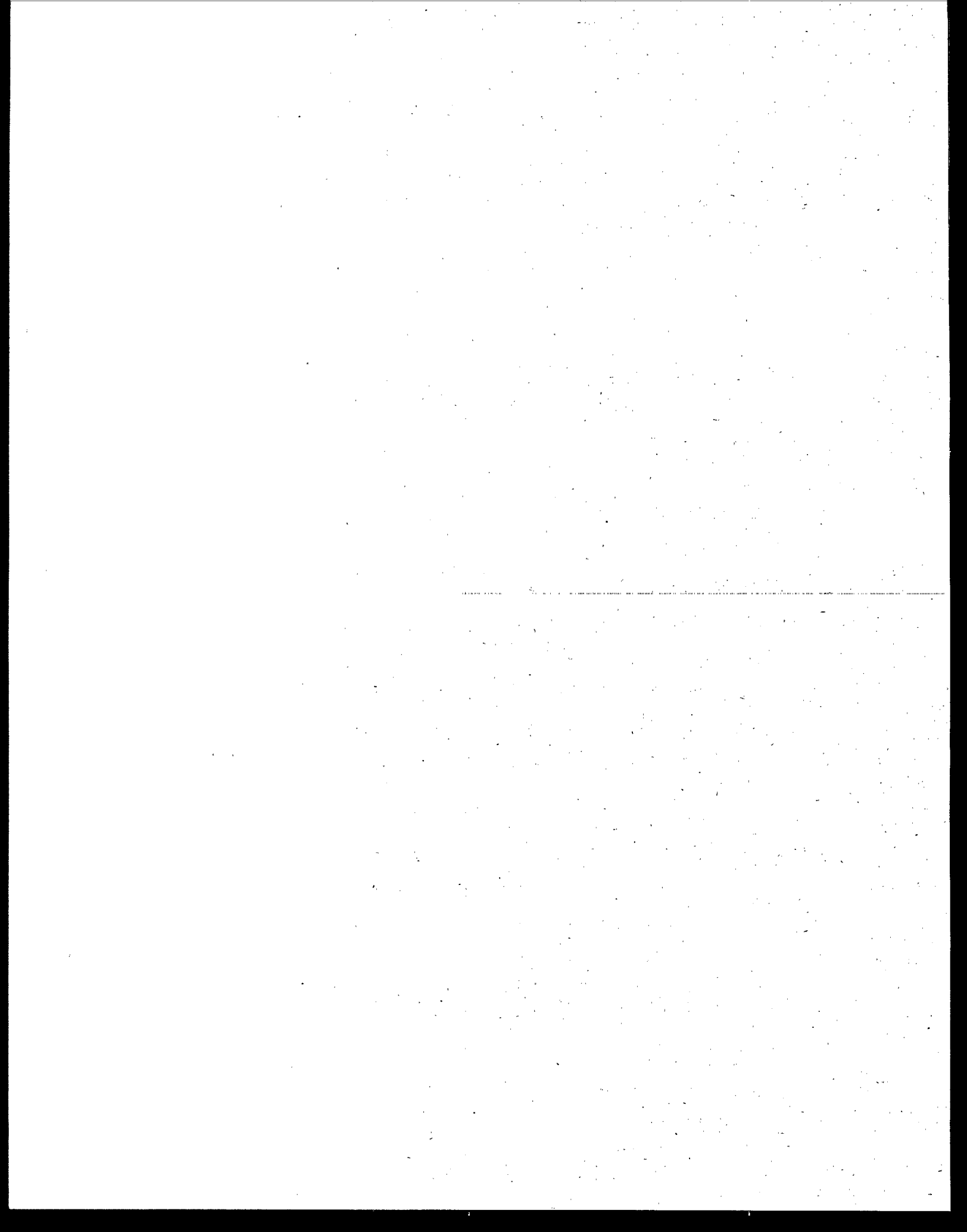
EXECUTIVE SUMMARY	1
MAJOR FINDINGS - NON-FEDERAL EXCHANGES	1
MAJOR FINDINGS - FEDERAL EXCHANGES	2
RECOMMENDATIONS	2
Chapter 1 - BACKGROUND	4
INTRODUCTION	4
BACKGROUND	4
Chapter 2 - PROFILES OF CURRENT NORTH AMERICAN WASTE EXCHANGES	7
OVERVIEW	7
NATIONAL MATERIALS EXCHANGE NETWORK (NMEN)	14
OPERATIONS OF INDIVIDUAL WASTE EXCHANGES	16
Southeast Waste Exchange (SEWE)	16
Iowa Waste Reduction Center (IWRC)	17
Industrial Materials Exchange Service (IMES)	18
California Materials Exchange (CALMAX)	18
Resource Exchange Network for Eliminating Waste (RENEW)	19
Pacific Materials Exchange (PME)	20
Canadian Chemical Exchange (CCE)	20
Canadian Waste Materials Exchange (CWME)/Ontario Waste Exchange (OWE)	21
California Waste Exchange (CWE)	22
FEDERAL WASTE EXCHANGES CONTACTED	22
Department Of Defense	22
Other Federal Agencies	23
Chapter 3 - DESCRIPTION OF WASTES AND CUSTOMERS OF WASTE EXCHANGES	25
WASTES LISTED AND TRANSFERRED BY WASTE EXCHANGES	25
WASTES EXCHANGED	27
TYPES OF WASTES EXCHANGED	28
ONE TIME VERSUS ON-GOING EXCHANGES OF MATERIALS	29
TYPES OF COMPANIES USING WASTE EXCHANGES	29

CONTENTS (continued)

Chapter 4 - EVALUATING SUCCESS	31
WASTE EXCHANGE GOALS	31
MEASURING SUCCESS IS DIFFICULT	32
Number of Listings	32
Number of Exchanges Accomplished	33
Ratio of Exchanged Waste to Listings	34
Cost of Exchange per Ton Exchanged	34
Number of Inquiries	35
Savings to Business from Waste Exchange	35
Educational and Outreach Activities	36
IMPORTANT SUCCESSES NOT EASILY MEASURED	36
Chapter 5 - FUNDING MECHANISMS	38
TIPPING AND WASTE FEES	39
OTHER PUBLIC SOURCES OF FUNDING	39
CATALOG SUBSCRIPTION FEES	40
LISTING FEES	40
TRANSFER FEES	40
REVENUES FROM ADVERTISEMENTS	41
Chapter 6 - RELATIVE MARKET POSITION OF WASTE EXCHANGES	42
WASTE EXCHANGES	42
BROKERS	42
CORPORATE SECONDARY-MATERIALS MARKETING	43
RELATIVE MARKET STRENGTHS OF INDIVIDUAL WASTE EXCHANGES	44
Chapter 7 - WASTE EXCHANGES AND ENVIRONMENTAL LIABILITY ISSUES	45
RCRA LIABILITY	45
CERCLA LIABILITY	46

CONTENTS (continued)

Chapter 8 - ROLES OF WASTE EXCHANGES	49
ROLES OF WASTE EXCHANGES	49
Providing Information to Identify Potential Trades	49
Matching Buyers and Sellers	49
Facilitating Reuse of Wastes as Secondary Material	50
Facilitating Market Development	50
Providing Education and/or Technical Assistance	50
Relating Recycling to Pollution Prevention and Other Waste Minimization Options	51
FACTORS INFLUENCING SUCCESS/FAILURE	51
Chapter 9 - FINDINGS AND RECOMMENDATIONS	53
GENERAL FINDINGS	53
Current Operations	53
Types And Amounts Of Wastes Transferred	53
Funding	54
Benefits To Participants	54
Benefits To State/Local Governments	55
SPECIFIC FINDINGS	56
Non-Federal Waste Exchanges	56
Federal Waste Exchanges	56
RECOMMENDATIONS	57
NOTES	59



EXECUTIVE SUMMARY

Waste exchanges were established to facilitate recycling and reuse of industrial and commercial waste. This study reviews the current activities and status of North American waste exchanges, including marketing systems for waste and surplus from the federal government. It also provides recommendations for encouraging greater levels of reuse and recycling through waste exchanges.

MAJOR FINDINGS - NON-FEDERAL EXCHANGES

- The service provided by waste exchanges varies significantly. Most exchanges list waste available and waste wanted. The listings most commonly appear in a catalog format, however, some exchanges are beginning to utilize on-line computer information systems. While some exchanges simply manage these listings and respond to requests for information, others are proactive in:
 - seeking companies which might need their services
 - matching generators with companies that need materials
 - providing outreach through workshops, bulletins, and advertising
 - providing on-site plant assessments of reuse and recycling opportunities
 - referring generators to state technical assistance centers to evaluate waste reduction opportunities.
- More non-hazardous than hazardous wastes are transferred through waste exchanges; liability concerns and RCRA restrictions limit reuse and recycling of hazardous wastes through exchanges.
- Waste exchanges tend to receive listings of wastes which are more difficult to transfer or have a lower value than those transferred through specialized brokers (dealing generally with narrow, higher-profit market segments) or directly sold by companies (which often have their own networks for large volume or continuously-produced process wastes).
- Waste exchanges are small, ranging from only a fraction of one person's time to six full-time people, and have budgets between \$10,000 and \$200,000. Some serve a single state while others are regional.

- While individual waste exchanges are relatively small, the number of waste exchanges is rapidly increasing. Many states are now forming their own exchanges in response to concerns about disposal and treatment capacity.
- A major reason for the increase in the number of exchanges appears to be the establishment of the National Materials Exchange Network (NMEN). This network is a national, computerized listing service, funded by EPA, in which all but two current U.S. exchanges participate. Participation in NMEN might reduce the administrative burden of establishing, managing, and publicizing listing services for some local exchanges.
- Measures of "success" for waste exchanges are not simple. Financial self-sufficiency appears to be an unrealistic goal, since so many of the wastes listed have a low value or are difficult to exchange. Other measures (e.g., number or volume of listings, number of transactions or volumes of waste transferred) all have limitations. In particular, the value of educational, promotional and technical assistance services with respect to reuse and recycling is difficult to assess. By some measures (e.g., cost/ton transferred), however, waste exchanges appear to compare well to other forms of publicly-funded reuse and recycling efforts.

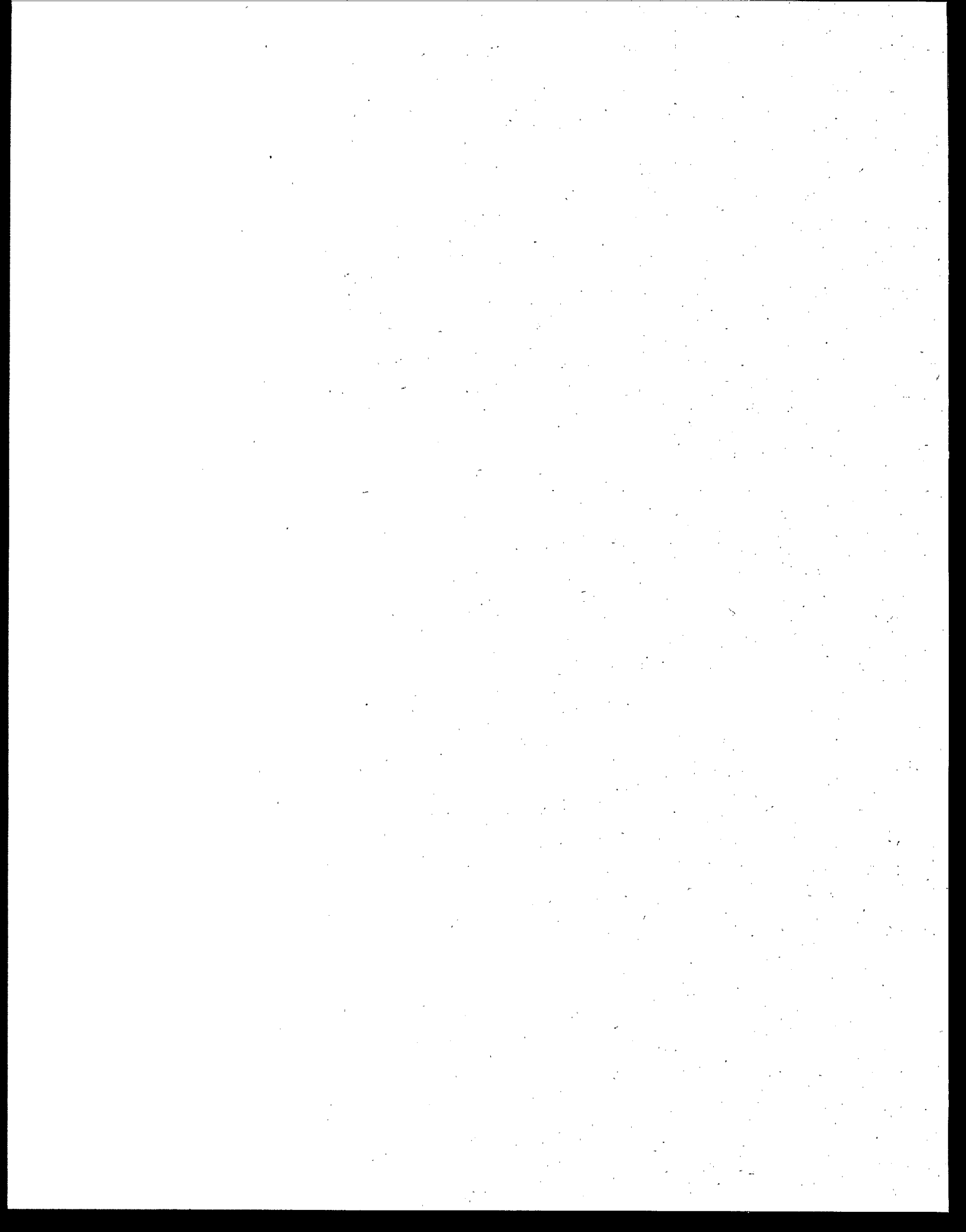
MAJOR FINDINGS - FEDERAL EXCHANGES

- DoD's Defense Reutilization Marketing Organization (DRMO) has an extensive system for the sale and/or reuse of recyclable materials (hazardous and non-hazardous). Materials turned in by individual DoD facilities are first made available within DoD and then offered externally.
- GSA's waste/surplus system is less extensive in the area of hazardous waste and not as well differentiated as the DoD system. It nonetheless offers substantial volumes of surplus/waste for reuse and recycling.

RECOMMENDATIONS

- Consider mechanisms to limit liability for exchanges and users of exchanges and clarify regulatory issues regarding the reuse and recycling of hazardous waste. Currently, a company might make a good-faith effort to exchange a hazardous material with another company, but will continue to be held financially responsible for any future mishandling of that material by the receiving company or any other company. The effect of this high-risk scenario is that companies are forced to forgo the potential savings from avoided disposal that an exchange could provide, in order to protect against potential future liability.

- Promote the integration of non-federal and federal waste exchange information systems, including the sharing of listings and the promotion of exchanges in both directions. By creating a larger marketplace, an integrated system could be a magnet for increased private sector participation in exchanges.
- Continue support for a national information network. Many of the new and developing exchanges are depending on the advertising potential of a national network. Additionally, the presence of a national information service allows exchanges to focus on more proactive services to match users and donators of wastes.
- Consider alternatives (e.g., grants) to support the development/continuation of model waste exchanges, providing more proactive services (e.g., education, technical assistance, direct marketing of services). Such model approaches should include some provision for market-testing of exchange services. Possible examples might include a competitive approach such as that utilized by the Iowa Waste Reduction Center, or a requirement that the waste exchange receive a certain portion of its funds from non-governmental sources (fees, private-sector matching funds, or other alternatives). Interested exchanges should be encouraged to propose their own market-testing approaches.
- Consider additional ways to promote the visibility of all waste exchanges in the business community and among trade groups.
- Consider an in-depth analysis of the exchange of hazardous wastes, including: who is making the trades, and the types of wastes which can be most effectively transferred via waste exchanges in spite of the potential regulatory barriers.



Chapter 1

BACKGROUND

INTRODUCTION

Waste exchanges provide a mechanism for recycling and reusing industrial waste. In general, waste exchanges try to "match-up" generators of waste with companies interested in recycling or reusing these materials. The benefits of waste exchanges include: reduced disposal costs; reduced disposal quantities; reduced demand for natural resources; and, a potential increase in the value of wastes. This document examines the effectiveness of industrial waste exchanges as a tool to minimize waste disposal and to encourage the reuse and recycling of valuable materials.

The focus of this investigation is the potential for increasing the role of waste exchanges. In researching current waste exchange activities, both private and government exchanges were examined. Data regarding exchanges were obtained from literature searches as well as in-depth interviews with operators of several exchanges. Data gathering focused on the following topics:

- Operational requirements, constraints
- Users of waste exchanges
- Typical wastes exchanged
- Impact of government regulations
- Alternative methods of exchanging wastes
- Measuring success
- Funding sources
- Marketing efforts
- Impact of regional, national exchange efforts.

BACKGROUND

During World War II, waste exchanges were established to conserve valuable resources and equipment. The earliest known waste exchange, the National Industrial Materials Recovery Association, was established by the British in 1942. When World War II ended, most exchanges had met their resource conservation goals and ceased to exist.

In 1972, the concept of promoting transfers of industrial wastes was reborn in Europe. In that year, the European chemical industry formed two exchanges; the Federation of Belgian Chemical Industries and the Association of Netherlands Chemicals Industries. Both of these exchanges took the form of information clearinghouses that listed wastes available and

requested. Neither exchange actively worked to facilitate transfers between potentially interested parties. Nevertheless, estimates from the Netherlands exchange, the VNCI Waste Exchange, suggest that 30% of their listings resulted in successful transactions.

Shortly after these two exchanges commenced operations, other European nations began to recognize the environmental benefits of promoting the reuse of industrial wastes and established their own exchanges. From 1972 to 1976, approximately 12 exchanges were established in Europe. Among these were exchanges formed to serve industrial waste generators and potential users in Austria, Finland, Germany, Italy, Norway, Sweden, and Switzerland. Notably, an international waste exchange was established in 1975 by a federation of industries in Denmark, Finland, Norway, and Sweden. By 1978, France had joined the growing number of European exchanges.

At the same time, nations outside of Europe also began to consider establishing waste exchanges to help conserve resources and reduce the volume of wastes requiring disposal. During the early to mid 1970s, numerous waste exchanges were set up in New Zealand. The government of Australia in 1977 set up an Industrial Waste Exchange which still operates today. A waste exchange was also set up in Israel during the late 1970s.

The first North American Waste Exchanges were established in 1973. Zero Waste Systems in California was the first U.S. exchange. Concurrently, ORTECH International, a provincial research organization in Ontario, Canada, established an exchange that is still operating as the Canadian Waste Materials Exchange (CWME). This exchange has become the hub of a growing network of active Canadian waste exchanges currently serving Ontario, Manitoba, Alberta, and British Columbia. CWME is funded by the Canadian government, but it also receives some supplemental funding from industry participants.

By the mid to late 1970s, waste exchanges were beginning to proliferate in the United States. In 1975, exchanges began in Boston and St. Louis. By the end of 1976, waste exchanges were operating in Iowa, Illinois, and Georgia. Additional exchanges were open in Ohio, Minnesota, New York, New Jersey, Indiana, Texas, North Carolina, and Washington State by the end of 1978.

Most of these early waste exchanges served as information exchanges and did not actively pursue matches of industrial waste generators and users. While some of the early exchanges operated for-profit, most were not-for-profit. The for-profit exchanges tended to deal solely with surplus inventories, while the not-for-profit exchanges facilitated transactions in surplus inventories, off-spec products, and waste products. Hazardous wastes were included on many of the waste exchanges and, in fact, some exchanges dealt primarily with hazardous wastes. Waste exchanges were generally limited to trades on a regional rather than national basis. Funding for the early exchanges came from several sources: government (federal, state, and local), private donations, listing fees, and subscription fees. In general, exchanges that specialized in higher value materials could survive without government

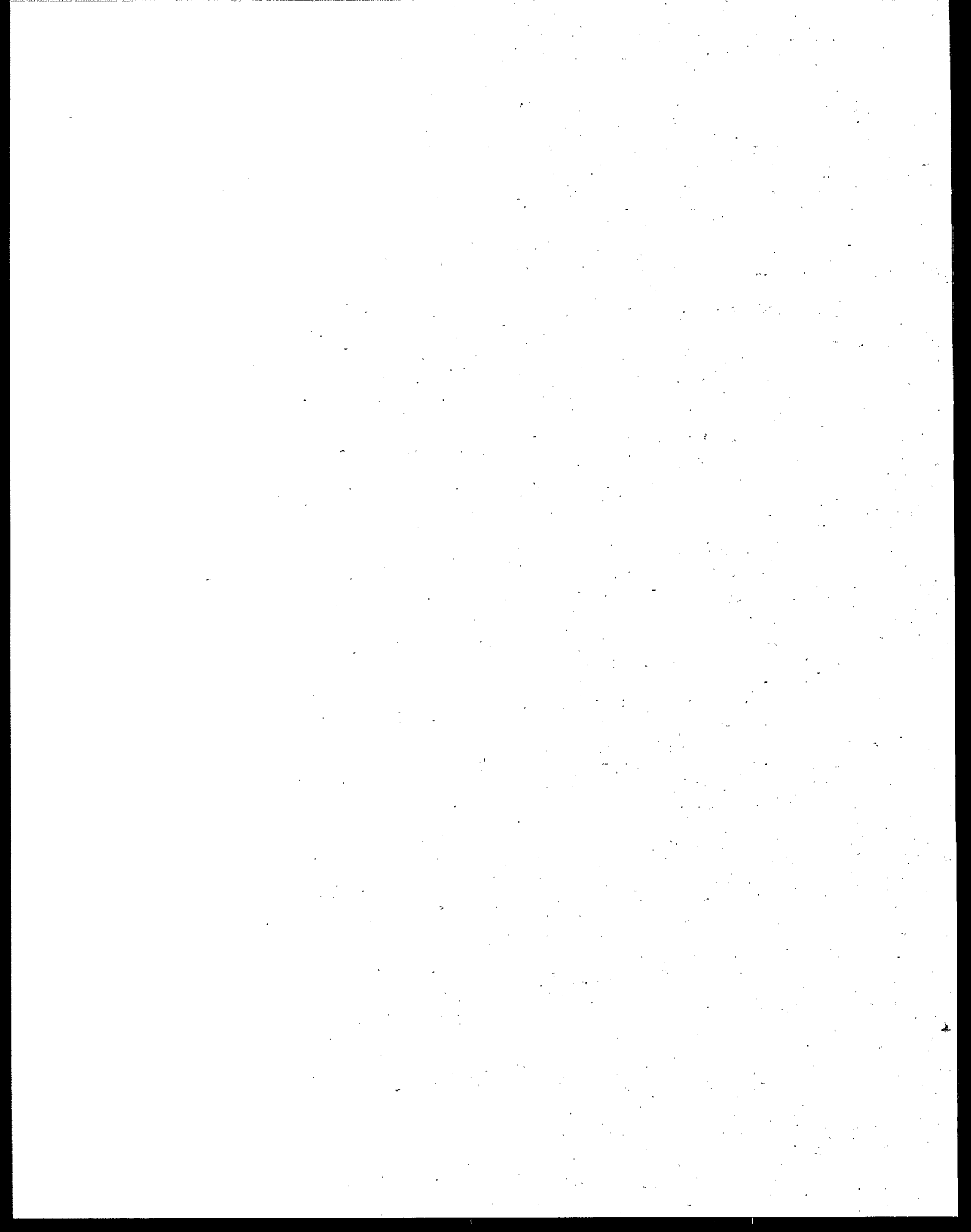
funding; exchanges working to create transactions with impure, low value, or hard-to-place materials required ongoing government support.

The initial waste exchanges established during the 1970s, with the exception of the Southeast Waste Exchange (SEWE) and the Canadian Waste Materials Exchange (CWME), are now closed. They succumbed to reduced financial support from governments or to changes in solid waste disposal regulations that severely restricted transactions involving hazardous wastes. The January 4, 1985 revisions to the regulations governing hazardous waste reuse and recycling (Resource Conservation and Recovery Act [RCRA]) provided definitions for several methods of reuse and recycling and types of secondary materials. In addition, the preamble to this rule contained guidance on distinguishing sham reuse and recycling situations (50 FR 638). After promulgation of this new regulatory framework, it became necessary for firms engaged in hazardous waste reuse and recycling to take steps to ensure that their reuse and recycling operations were legitimate and protective of human health and the environment. The unintended result of this change was that many companies stopped using waste exchanges for hazardous wastes because cradle to grave liability made the potential risk too great. Generators were also discouraged from using waste exchanges because the time it took to transfer items could often exceed the limits for hazardous waste storage established under RCRA. The early 1980s also marked a time when government funding (federal and state) for solid waste programs was reduced dramatically. It became increasingly difficult to obtain funding for waste exchanges.

The effect of these changes can be documented. A review of the North American Waste Exchanges listed in a 1980 EPA Report, Waste Exchanges: Background Information (SW-887.1), indicated that many of the exchanges listed in this report have ceased operation.

In recent years, computers and telecommunications technology have increased the ease with which waste exchanges can be set up and managed. For instance, a national computer bulletin board is linking regional markets together. States and municipalities are starting local exchanges, in contrast to the larger regional exchanges that were popular in previous years. Waste exchanges began as information sharing entities, but have recently begun to actively seek wastes and markets for those wastes.

Throughout their history, waste exchanges worldwide have faced similar problems as they attempt to expand and grow. As the waste exchange concept grows and becomes part of standard business operating procedures, today's operational problems (e.g. funding, marketing, liability concerns) will need to be solved for waste exchanges to succeed.



Chapter 2

PROFILES OF CURRENT NORTH AMERICAN WASTE EXCHANGES

OVERVIEW

More than fifty waste exchanges are currently operating in North America, providing a mechanism for companies generating or in need of waste materials to identify possible markets for waste sources as well as for raw materials. Exhibit 2-1 shows the locations of waste exchanges currently operating in North America. Exhibit 2-2 is a directory of these exchanges. The number of exchanges appears to be increasing rapidly, especially with the recent creation of a government-funded, national information system. Waste exchanges generally promote the transfer of a wide variety of waste streams.

Waste exchanges have a variety of approaches for facilitating the transfer or sales of wastes. The most common (but not universal) mechanism is a catalog or other listing system through which companies can learn about each other's available or needed wastes. Providing a passive listing service of this kind requires less staff and financial resources (many waste exchanges have only one full-time employee, or a fraction of one person's time). Most waste exchanges also joined a new national computerized listing system funded by EPA, the National Materials Exchange Network (NMEN). NMEN began operating early in 1993. Some waste exchange listings include names and contacts for the companies listing wastes or needs so that an interested company can make direct contact without going through the waste exchange. However, waste exchanges generally require the interested party to contact the exchange to obtain that information. This is done to be able to track transactions, to determine levels of interest in particular materials, or to obtain the information necessary to charge fees of various kinds.

Few waste exchanges have the resources to take a more proactive approach. Some exchanges seek out companies which potentially might generate, or have a use for, common waste streams. Few even provide on-site plant assessments to help companies identify their reuse and recycling opportunities. These assessments also can include evaluation of waste reduction opportunities, or referrals to state pollution prevention technical assistance programs. Other exchanges provide training and educational services on reuse and recycling, or advertise on the benefits of reuse and recycling. As expected, these more proactive approaches require staff with considerable expertise about reuse and recycling opportunities and often involve field staff whose primary role is to pursue possible matches of needs and supplies.

As is apparent from a glance at the map (Exhibit 2-1), there are waste exchanges in most of the U.S. states and some Canadian provinces. Some of these are very small, less active services limited to the particular state. Others provide service to, and receive

Exhibit 3-1

Location of Waste Exchanges Operating in North America

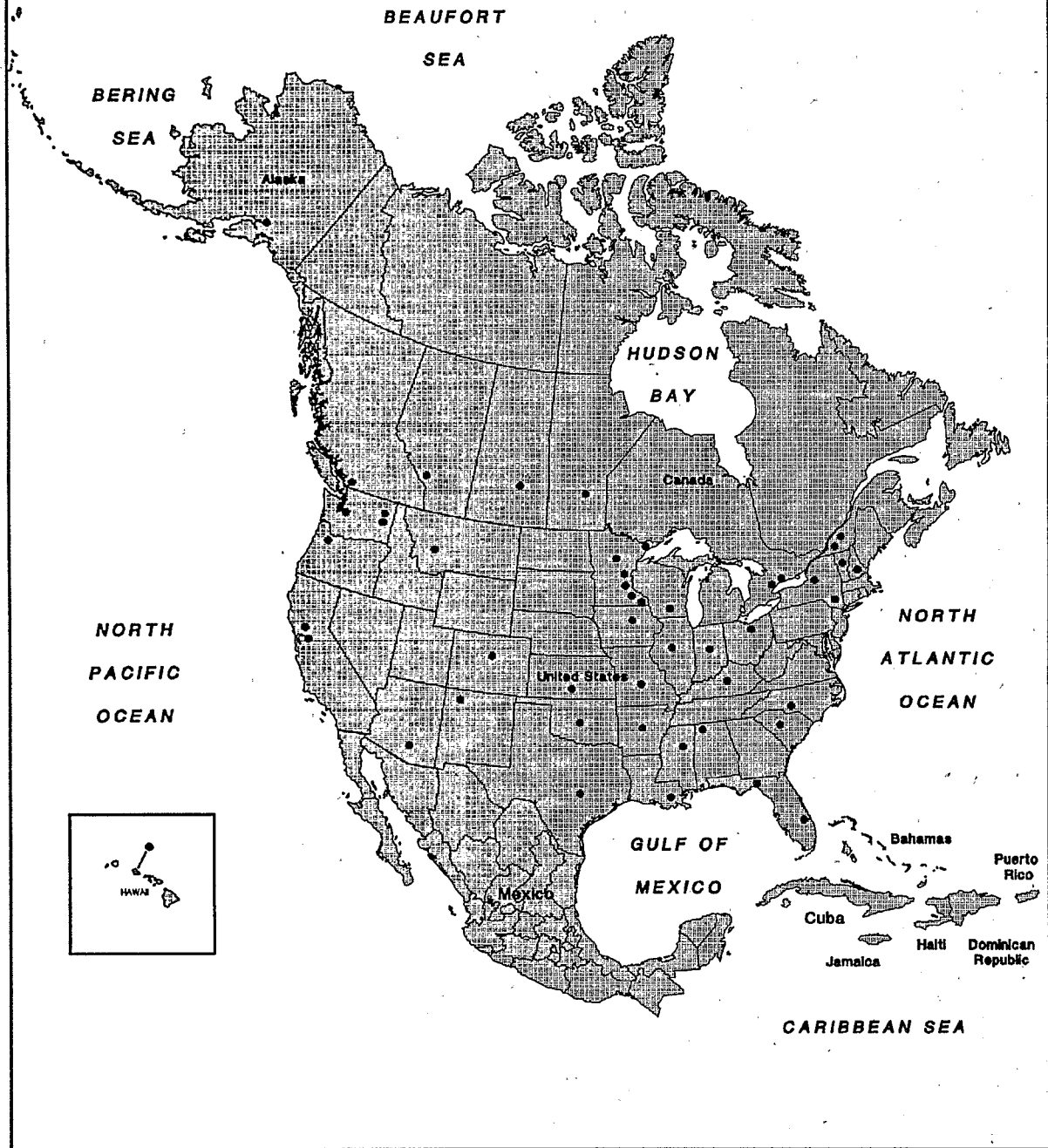


Exhibit 2-2

Directory of Waste Exchanges Operating in North America (As of March, 1994)

Note: [] indicates primary market area.

CANADA

Alberta Waste Materials Exchange (AWME)

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FAX 604 734-7223 (will change July 1st).
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[MB]

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[Ontario]

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[QU]

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[CA Hazardous Waste]

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[IN]

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Intercontinental Waste Exchange (IWE)

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Future Minnesota Alliance Participators: *

*** Businesses Allied to Recycle through Exchange and Reuse (BARTER)**

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*** Review Materials Exchange**

Mr. Adam Haecker
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*** Southeastern Minnesota Recyclers Exchange (SEMREX)**

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Winona, MN 55987
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[MN]

*** Tri-County Materials Exchange (TRI-MEX)**

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FAX 218 727-7471
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[MO]

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[SC]

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[WI]

support from, an entire region. In the past, for example, the Northeast Industrial Waste Exchange (NIWE), based in Syracuse, has provided service to, and received funding from, most of the states in the northeast. Currently, only four of the fourteen states served by the exchange are funding its operation due to reductions in state budgets. It is not clear yet whether the combined effect of the proliferation of state exchanges and the National Materials Exchange Network (NMEN) system will be to augment or reduce the role of regionally-based exchanges.

NATIONAL MATERIALS EXCHANGE NETWORK (NMEN)

In 1991, as a result of a Congressional appropriation, EPA awarded a grant of \$350,000 to the Pacific Materials Exchange (PME) and \$150,000 to the Great Lakes Exchange to develop a computerized National Materials Exchange Network (NMEN). The Great Lakes Exchange subsequently went out of business. Their funding and development responsibilities were shifted to PME. NMEN became operational in January of 1993.

The rationale behind the establishment of a national exchange network is as follows:

- materials exchanges take place at both local and national levels.
- different geographic regions have distinct waste materials and markets.
- the greater the number of materials identified, the more diverse the markets.
- the more people exposed to the listings, the greater the possibility of accomplishing successful exchanges.

NMEN is a multi-user electronic bulletin board with material listings from the 42 participating exchanges. The available and wanted listings, which can be accessed by computer modem, are divided into 17 material categories. Listings can be sorted by region, state and category. The NMEN software automatically keeps track of the number of users, the number of calls, and the number of inquiries about each listing (with the listings identified with the appropriate waste exchange). Users accessing the listings can find the same type of information available in catalogs. When the listing firms do not want to be directly contacted, the inquirer is referred to the waste exchange supplying or managing the listing. Participating waste exchanges can use the system to find out who has inquired about their listings and who has put new listings on the board. The exchange can then follow up with the inquirers to facilitate an exchange of materials or to market their exchange's services.

NMEN has enlisted the participation of 42 of the 53 known currently operating North American waste exchanges in the network, giving those accessing the database the opportunity to view over 9,000 listings. An on-line bulletin board can substantially reduce the amount of time between when a material is listed and when the listing can be accessed by users.

The existence of NMEN, along with state and local waste reduction requirements, is spurring the development of new state and local exchanges. NMEN reduces the start-up costs for an exchange by providing a nationwide computer system which can publicize listings generated by an exchange and can provide access to a large number of listings. To reduce the cost of running an exchange, the staff working with NMEN has developed software which allows an exchange to download all of its listings into a database. The software sorts the data and loads it into WordPerfect to print a catalog or customized listing for clients.

The NMEN staff recognize that they can not rely on the federal government for all financial support. PME is currently searching for other ways to finance the operations of NMEN by pursuing grants from foundations and continues to search for corporate support. PME is finding that Fortune 500 corporations, while supportive and often enthusiastic about the idea of a national waste exchange, are not as responsive to providing financial support. Representatives of large corporations contacted by PME have indicated that it could take several years to educate management about the potential of waste exchanges. PME is also considering ways to partially finance NMEN by selling individualized computer generated reports to interested parties, such as brokers. NMEN is reluctant to charge for its basic services because it is still so new and needs to build a large base of users in order to be useful. Although funding needed to run the exchange totals only about \$200,000 annually, it is not evident whether it can be raised privately in the near future.¹

NMEN has just completed one year of operation and has not yet had the full opportunity to demonstrate its impact on waste exchanges. Many of the newer exchanges, such as the Arizona Exchange, are dependent on the system for their operation. The viability of many exchanges, particularly those now in development, might depend on the existence of the national network. Some of the established exchanges are finding NMEN to be a useful tool and are using it actively. Other exchanges are still trying to obtain the hardware necessary to run NMEN or are in the process of learning how it works. Using NMEN can initially add to the workload of an exchange if it has to manage the records on NMEN as well as the exchange's own system. During this transitional time, NMEN staff are managing records and informing exchanges when users place new listings or inquire about existing listings in their region.

Two established exchanges maintaining an electronic bulletin board service of their own have chosen not to participate in NMEN. In fact, some exchanges that have tried regional bulletin board services are not enthusiastic about their value. ORTECH International, a provincial research organization in Canada, surveyed exchanges' use of electronic bulletin boards; for the three exchanges answering the question about the percentage of exchanges made through the on-line system, the average was only two percent. The electronic bulletin boards considered in the survey, however, carried an average of only 150 listings. This is far fewer than the over 9,000 listings on NMEN which also has a much broader market of users. Many of the established exchanges are taking a wait and see attitude about NMEN, although one commented that "business loves the idea of the national electronic network".²

NMEN could be a valuable tool for states or localities for a number of reasons. Because of NMEN, technical assistance programs desiring to offer waste exchange as an alternative to disposal do not need to devote resources to starting and administering a local waste exchange. In the long run, NMEN offers established waste exchanges the opportunity to reduce some of the mechanical tasks of running an exchange by allowing the listings to be managed in the system and placed by companies directly. In fact, 171 direct entry listings have been placed in the first four and a half months of operation. Freeing the exchanges of mechanical tasks has the potential to allow them to devote more time to facilitating exchanges.

OPERATIONS OF INDIVIDUAL WASTE EXCHANGES

For the purposes of this study, nine waste exchanges currently operating in North America were contacted. Publicly available information, such as catalogs and annual reports, from a number of other exchanges were also reviewed. Lastly, waste exchanges operated by branches of the federal government, such as the Department of Defense and the General Services Administration were contacted. A general profile of each of these exchanges is provided below.

Southeast Waste Exchange (SEWE)

The Southeast Exchange, formerly the Piedmont Exchange, began in 1978 with county funding and is the oldest operating exchange in the United States. It has a staff of three, which is sometimes supplemented by student interns and faculty members working on special projects. The salary of the director, her secretary, and office space are all paid by the University of North Carolina at Charlotte. In addition, SEWE has a budget of about \$100,000 annually. An estimated 25 to 30 percent of the \$100,000 budget comes from catalog or bulletin board subscriptions, listings, and advertising fees. Other funding comes from grants, industry fund drives, and Mecklenberg County. The bulletin board service operated by SEWE also generates income for the exchange. SEWE reports 402 exchanges of over 98,150 tons of material in 1992, with savings to business of \$9,027,283.

The exchange has always sought to actively assist companies with their waste problems. SEWE often provides callers with immediate information on companies that might be able to use the caller's waste. For this reason, many of the materials it deals with never make it into the catalog. The SEWE staff also suggest waste minimization, waste reduction, and pollution prevention options. In addition, SEWE refers businesses to state agencies for regulatory advice and works directly with the North Carolina Office of Waste Reduction to provide further technical assistance on waste management options. For wastes which can not be reduced or recycled, SEWE provides lists of hazardous waste management firms with small quantity generator programs. The exchange conducts outreach through workshops run twice a year in the spring and the fall. These workshops often attract between 100 and 150 attendees, many of whom are from small quantity waste generating companies. It also participates in programs sponsored by the Chamber of Commerce and other business groups.

SEWE believes that companies contact the exchange more readily than government agencies because the exchange is private, located at a University, and respects confidentiality. The exchange also has its own bulletin board with listings from SEWE, Southern Waste Information Exchange (SWIX) and Northeast Industrial Waste Exchange (NIWE), along with other information on reuse and recycling. Access is limited to those with a subscription to the service. SEWE does not participate in the National Material Exchange Network.

Iowa Waste Reduction Center (IWRC)

The IWRC Waste Exchange was begun in 1990 as a pilot project funded by a \$60,000 Pollution Prevention Incentive for States (PPIS) grant from EPA. The need for a waste exchange became evident as more and more businesses in the state began asking IWRC for help in locating markets for their waste. In the spring of 1991, the Iowa legislature introduced legislation that authorized the collection of a \$.10 per ton tipping fee for the express purpose of funding the exchange. These funds, which are channelled through the Iowa Department of Natural Resources, currently amount to approximately \$200,000 per year. Of this amount, \$25,000 is allocated for IWRC administrative support and \$175,000 is available for grants to regional representatives of IWRC.

Potential representatives, who are usually affiliated with Community Colleges, compete annually for the grants. The grants currently range from \$16,000 to \$50,000 and allow the grantees to spend from 25 percent to 100 percent of their time visiting businesses, promoting the waste exchange, and searching for waste listings and markets. Grantees also provide information on where to get assistance with waste reduction, waste minimization or regulatory concerns.

The regional representatives are not necessarily technical experts in waste reduction or waste generating practices, but do have experience with economic development and understand the needs and concerns of businesses. The IWRC interacts with the representatives and provides them with technical information and training to help them identify waste reduction, reuse and recycling, and energy conservation opportunities as well as potential waste markets. One employee of IWRC is very knowledgeable in hazardous waste and provides technical assistance and information to the regional representatives when needed. Although only a small proportion of the exchange's listings are hazardous materials (7 percent of total listings; 11 percent of material matched in FY 92), in the future, the exchange expects to focus more on hazardous waste and less on plastics and paper as those markets become more consistent.

The IWRC Waste Exchange currently has about 1000 listings, half of which it advertises as part of the IWRC newsletter. The exchange works with businesses of all sizes, although it finds that much of the interest in the waste exchange comes from small businesses. In the last fiscal year IWRC facilitated the exchange of 254 materials totalling 29,547 tons. The savings to business from avoided disposal costs resulting from these exchanges was calculated to be approximately \$547,000. Avoided disposal costs are based on state tipping fees of \$25 per ton for solid, non-hazardous waste, estimated at \$200 for 55 gallon drums of hazardous waste, and estimated at \$800 for 55 gallon drums of paints. IWRC keeps in close

contact with companies that list on the exchange through its regional representatives, and is tracking exchanges carefully. IWRC is a member of NMEN, and expects to use the service primarily to locate markets for its listed materials.

Industrial Materials Exchange Service (IMES)

The Industrial Materials Exchange Service began in 1981 as a service of the Illinois Chamber of Commerce. It was subsequently taken over and run primarily by the Illinois EPA with support from the Illinois Chamber of Commerce. Since 1989, IMES has been a part of Illinois EPA's Office of Pollution Prevention, which supervises and funds its employees and activities. The IMES distributes over 13,000 catalogs nation-wide, although its market is primarily in the midwest. The exchange actively seeks markets for waste as well as generators of marketable wastes.

Two individuals serve as Waste Exchange Activators, one in the Chicago area and one in Southern Illinois. The Activators visit companies and offer the services of the exchange as well as advice on pollution prevention and waste reduction. The Activators identify uses for waste and match wastes with companies that might be able to use them. They find that many companies are not aware of the composition of their own waste and have never considered that the wastes might contain resources valuable to other users or for their own reuse. Because such companies do not recognize the opportunities for modifying or recycling their waste streams, the site visits provide the Activators with valuable information that can't be obtained over the telephone.

The IMES staff use waste generation reports to identify companies generating reusable or recyclable waste streams. They work with companies of various sizes, from conditionally exempt smaller generators (e.g., vehicle maintenance facilities) to larger companies interested in reducing disposal costs. Many large companies, however, remain hesitant to work with the exchange because of liability concerns. Less than half of the companies contacted by the exchange staff are willing to trade. They often do not provide any reason for their reluctance to trade.

IMES reports 1991 exchanges totalling 7,619,700 gallons or gallon equivalents of materials, with a value of \$13,092,444. In order to obtain these statistics, IMES sends out an annual survey to listing companies to find out if they have exchanged materials, the quantity exchanged, the value of the exchange as measured by both the avoided disposal cost, and the value of the materials. About 50 percent of the companies answer the mail survey. IMES follows up with the remainder by telephone. Many listing companies are negotiating exchanges at the time of the annual survey and the outcome of these negotiations is not followed by IMES. Therefore, statistics on exchanges are likely to be understated.

California Materials Exchange (CALMAX)

The California Materials Exchange was organized in July, 1991 in response to California Assembly Bill 939, which requires local jurisdictions to reduce landfill disposal by

25 percent in 1995 and by 50 percent in 2000. CALMAX handles only non-hazardous waste. In its first full year of operation, it was responsible for at least 65 exchanges accounting for nearly 112,000 tons of material. Funding for the waste exchange, which is estimated at about \$175,000, comes from the California Integrated Waste Management Board, which is funded from a \$.75 per ton tipping fee surcharge. CALMAX is operated by its contractor, the Local Government Commission (LGC), which handles the day to day activities of maintaining the listings, printing the catalog, and answering phone inquiries. LGC follows up on the listings after they run for two months in order to track exchanges and update the catalog. LGC is a nonprofit, nonpartisan membership organization of local elected officials.

CALMAX does not currently have staff to actively pursue waste exchanges, but hopes to be able to do so in the future. The waste exchange is actively marketed by its director through articles in magazines and speeches to industry and trade groups. It is sponsored by other state and local governmental authorities, as well as business groups, who often include information encouraging the use of CALMAX in mailings sent to members or in free advertisements in newsletters. The catalog, which is divided into sections by California region as well as by waste type, is sent to more than 5500 subscribers. CALMAX is a member of NMEN. The exchange has recently been reorganized into the Waste Diversion and Education division of the Integrated Waste Management Board, Business Assistance Section, which will more actively encourage business to reduce, reuse and recycle waste. In another educational effort, CALMAX organized the 1993 North American Conference on Industrial Recycling and Waste Exchange sponsored by EPA.³

Resource Exchange Network for Eliminating Waste (RENEW)

RENEW was established by the Texas Water Commission (TWC) in 1988 in response to Senate Bill 92 of the 70th Texas legislature. Its purpose is to promote the reuse and reclamation of materials and to disseminate information on the treatment and recovery of metals. Its annual budget of approximately \$100,000 is funded through state general revenues received by the Texas Water Commission. In addition, a small amount of revenue is received from the sale of advertising space in the bi-monthly catalog.

In fiscal 1992, RENEW received 142 new listings, documented 30 successful exchanges, and had 100 inquiries in negotiation. Disposal cost savings of \$22,680 were reported to RENEW by companies as a result of the exchanges. Since FY 1989, RENEW has listed close to 659 materials, resulting in at least 82 successful exchanges. In order to track listings, RENEW sends out self addressed stamped cards with every inquiry about a specific material or listing, asking information such as: whether the exchange was successful or not, and if not, why it was not; quantities exchanged; annual amount of material transferred; disposal cost avoided; revenues earned from the material; distance of exchange; proposed usage of material; and pre-exchange usage. RENEW staff estimate that less than half of the cards sent out are returned, so it is likely they are missing some transactions.

RENEW, as part of the Commission's Office of Pollution Prevention and Conservation, is part of an effort to provide non-regulatory technical advice and information

on waste reduction and waste minimization. Other services of the Office of Pollution Prevention include on-site pollution prevention assessments, pollution prevention workshops, and a recycling products directory of Texas. RENEW markets its waste exchange services through contact with companies referred to it by Office of Pollution Prevention professionals doing on-site assessments, as well as by staffing a RENEW information booth at trade shows.

Due to lack of staff, the exchange does not aggressively seek markets for waste materials, but it does target companies with specific waste streams for receipt of their free catalogs and mailings. They access the TWC's Registration System data base and select those generators with waste streams of interest either for economic value or for reuse and recycling potential. The RENEW catalog listings can also be accessed on the Texas Marketplace's electronic bulletin board, which is a state-sponsored service allowing buyers and sellers of goods and services access to electronic advertising. RENEW is part of NMEN, but has not yet utilized the service fully because of equipment difficulties.⁴

Pacific Materials Exchange (PME)

The Pacific Materials Exchange is a private, non-profit 501(c)(3), public benefit corporation, started in 1988 after a feasibility study funded by a grant from the local utility, the Washington Water Power Company. It is currently funded from revenues received from a \$48 per year subscription fee, as well as funds generated from hosting the 1991 North American Waste Exchange Conference on Industrial Recycling. The exchange, which once shared a catalog with the now defunct Great Lakes Exchange, is primarily a waste exchange listing service. Statistics on exchanges have not been maintained due to lack of staff and resources.

The National Materials Exchange Network, described in more detail earlier, was developed by the Pacific Materials Exchange under a grant from EPA and started service in January 1993. It is a multi-user, multi-tasking, bulletin board which contains available and wanted listings from 43 member exchanges including the PME.

Canadian Chemical Exchange (CCE)

The Canadian Chemical Exchange is a for-profit brokerage dealing mostly with virgin materials such as off-spec or overstock chemicals, dyes, pigments and pharmaceuticals. It generates over \$1 million Canadian dollars of revenue annually by purchasing excess chemicals and reselling them for a profit. The profit it earns depends on transportation costs, chemical purity, and the type of chemical it is reselling. CCE takes possession of the chemicals 95 percent of the time, and does not reveal the source to the buyer. It often uses non-profit and government agency waste exchanges for leads to help identify sources of chemicals. CCE has a good working relationship with the Ontario Waste Exchange on the narrow band of materials with which it works. It will often accept and warehouse chemicals identified by the Ontario Exchange for which there might be no immediate use.

CCE would like to handle larger volumes and/or, "dirtier" chemical wastes, but that would require more research, testing facilities, and knowledge of the processes generating the individual waste. It would also increase liability concerns.⁵

Canadian Waste Materials Exchange (CWME) Ontario Waste Exchange (OWE)

The Canadian Waste Materials Exchange and the Ontario Waste Exchange are both run by ORTECH International, a provincial research organization. The CWME is a passive listing service started in 1978. It publishes a bi-monthly catalog with a budget of approximately \$70,000 Canadian dollars per year. An estimated 30 to 35 percent of the budget comes from advertising fees and a \$70 subscription fee, with the remainder coming from the government. The CWME, which is now connected to NMEN, takes less than one full time person to run. Total documented exchanges from 1978 through April 1992 for CWME number 803, with 441,000 tons per year of ongoing exchanges and one time exchanges of 112,500 tons.

The Ontario Waste Exchange, which was initiated in 1984, began actively seeking markets for waste and waste generators in 1987. It has a staff of three and a half people who maintain an internal database (not currently accessible to the public) of listings, information on company waste and waste needs. They match waste generators with potential waste users by phone or by printing out a list of potential markets for the waste and faxing it to inquirers. Staff try to focus their efforts on the wastes they expect to be harder to place. Over 60 percent of the exchange's contacts are through referrals (about equally divided) from either industry colleagues or the provincial environmental or commerce ministries. About 3600 waste streams are placed on the waste exchange each year. The Ontario Waste Exchange has no printed catalog. Listings older than two months go into the Canadian Waste Material Exchange's catalog. The Ontario Waste Exchange is also a member of NMEN.

The OWE keeps track of transfers by faxing follow-up letters requesting information on possible exchanges resulting from their efforts. A recent report issued by ORTECH, which surveyed the exchange's clients, found that their method of follow-up underreports exchanges of waste materials. ORTECH estimates 502 exchanges per year, with an estimate of 100,000 tons of new excess materials exchanged per year. Slightly more than half of the exchanges each year are for non-hazardous materials, which is an increase compared to past years.

The Ontario Waste Exchange annual budget is approximately \$250,000 Canadian dollars, with most of the funds provided by the Ontario government. The exchange calculated that in 1991-1992 it was able to facilitate new exchanges at a cost of \$3.50 Canadian per ton compared to publicly financed curbside pickup costs of \$100-\$200 per ton and hazardous household waste programs costing \$2000-\$10,000 per ton of materials diverted from disposal.⁶

California Waste Exchange (CWE)

The California Waste Exchange, which is part of the Department of Toxic Substances Control, began operation in 1976. It is an informational exchange dealing only with hazardous

waste. CWE produces one newsletter/catalog per year and an annual directory of industrial recyclers. It gets approximately 15 to 20 new listings a year and takes less than one person working full time to run. CWE does not track exchanges and has no way of knowing whether they occurred.

The majority of CWE listings are for surplus laboratory chemicals and unused materials. While there are some industrial process wastes in the catalog, most of them are old listings. The 1992 catalog had some listings of available material from as far back as 1986. The old listings were deleted from the 1993 catalog after CWE called listers to see if the materials were still available.⁷

FEDERAL WASTE EXCHANGES CONTACTED

There are two "waste exchange" operations in place in the federal government: the Department of Defense Reutilization, Transfer and Donation Program (DoD R/T/D Program) and the General Services Administration (GSA) Utilization and Donation Department. The DoD R/T/D Program is part of the Defense Reutilization Marketing Organization (DRMO) which is run by the Defense Reutilization Marketing Service (DRMS) which is part of the Defense Logistics Agency. DRMO offices are located at all DoD facilities world-wide. The GSA program is run from GSA headquarters.

Department Of Defense

A military installation with an item it can no longer use or a waste it wants to recycle fills out a DoD material transfer form and gives a description of the material to the DRMO office located on-site. The DRMO office catalogs the material based on a generalized groupings list (paint, acid, cleaning compound, etc.). This general description makes up the first four digits of an item's stock number. People looking for a general type of product can search for all items listed with that four digit code. Items are listed on a computerized DoD-wide database indicating the item's stock number, general category, name, specific chemical ingredients (if they are available), the percent of hazardous components, manufacturer, quantity, supplier location, supplier name, and date listed on the database. Items then remain on the system until they are exchanged, sold, or disposed of as waste. The database also makes notations of the last activity regarding a given stock number. For example, if 75 barrels of a commodity were listed, but only 50 were exchanged, the database would note that 25 barrels were still available for transfer. The DoD program handles primarily hazardous wastes, but does include some non-hazardous waste.

The DoD R/T/D Program was established by Congress in 1972 and is free to DoD facilities, although the receiving facility is required to pay for shipping. Most, if not all, military and government owned DoD facilities participate in the DoD R/T/D Program. If an item has been offered to other DoD facilities and no request has been made for it, then the surplus item is made available to other federal agencies, state and local governments and the public. After an item has been offered to other DoD facilities, the DRMO will provide a

listing of a surplus item to the GSA Utilization and Donation Department, which provides federal agencies and state and local governments access to the military's surplus items. Federal agencies and state and local governments can obtain surplus items at a cost that covers the DRMO's administrative expenses plus shipping costs. The public is able to obtain a catalog from DRMO of available materials that it can purchase at market price plus shipping fees.

DRMS has very strong concerns about their potential liability when surplus hazardous materials are transferred out of a military facility. Because DRMO is the supplier of a hazardous waste in these transactions, they are classified as a waste generator and have all the liability assigned to generators. Therefore, DRMS goes to great lengths to find out how a material will be used. They carefully review all outside requests for surplus hazardous materials and examine how the material will be re-used and eventually disposed.

One key to the success of the DoD R/T/D Program is that DRMO staff knows which materials are available and who could use them. Facility staff periodically review the listing information to see if materials are listed that they know an organization is interested in receiving and reusing. As a result of these efforts to cultivate clients, 60 percent of the surplus items generated by the military is sold to federal, state, local, and private interests. An additional 15 percent is traded within the DoD. The remaining twenty-five percent is disposed of as waste. In reviewing hazardous waste transactions, approximately 50 percent of all listed hazardous wastes are successfully transferred by the DoD program.

DoD procurement contracts often require the supplier to take back or provide a refund for unused materials. For example, a paint supplier might sell 20 cans of paint to an Air Force base that ends up using only 16 cans. The supplier would then be required to take back the four unused cans. Many DoD materials are also designed to very precise specifications set out by the military. When a product is designated as "used" by the military, it might still be useable in other, less demanding operations. For example, an Air Force cleaner used in cleaning fragile electronic parts could be cheaply recovered for use in cleaning automotive parts. This "low-technology" use for a previously "high-technology" product gives it an added life-span before it is eventually disposed.

Other Federal Agencies

For civilian federal agencies, all surplus item transfers (including industrial wastes) are facilitated by the GSA's Utilization and Donation Departments, which are located in 10 regional offices around the country. Anyone in any federal agency can offer a surplus item, new or used, to the GSA regional office to be listed as available for transfer. The GSA has not established a separate office to handle hazardous waste, due largely to a lack of volume, so surplus chemicals are listed using the same process as that for automobiles, forklifts, computers, or any other surplus item available for transfer. Hazardous materials handled by GSA are largely consumable items, i.e., paints, solvents, glues, detergents, and lubricants.

To transfer an item, department or agency employees fill out an excess property sheet and send it to the Utilization and Donation Department regional office for their area. The item is listed in a computer database and in a hard-copy paper listing. There are thousands of items in the database at any one time. A federal civilian employee can access this database through his or her computer and a modem. A hard-copy listing is distributed to state governments and, through the state, to local governments. Any remaining surplus items are offered to the general public via auctions. These are advertised by distributing flyers and bid packages listing items to be offered and auction information. The majority of the excess materials the Utilization and Donation Department disposes of each year is sold at public auction, rather than transferred to other federal agencies or state governments.

GSA Utilization and Donation Department personnel could not provide a hard figure on the amount of hazardous materials they transfer each year, but anecdotally they state that there is not a large quantity of hazardous materials relative to the non-hazardous items that they handle. The amount of non-hazardous surplus materials the Utilization and Donation Department transfers each year is also anecdotal, with the figure put in terms of billions of dollars worth of merchandise. A Washington, D.C. Utilization and Donation employee mentioned that she was able to sell \$12 million of surplus items in one month (this value includes very little, if any, hazardous waste). The key difference between listing hazardous and non-hazardous materials in the GSA is that hazardous materials require a Material Safety Data Sheet (MSDS) to be completed, must be labeled properly, and must be shipped in accordance with Department of Transportation regulations. If an item is sold to the public, the receiving individual must fill out a certification form that states who he or she is and for what purpose the chemical will be used. Otherwise, a pallet of surplus paint is no different from a used desk, and can be transferred, donated, or sold to the public. The largest generators outside of DoD are the four GSA supply depots located in Stockton, CA, Fort Worth, TX, Atlanta, GA, and Burlington, VT.

GSA admits that due to a lack of staff resources, there is no real follow up to see how a chemical was used or disposed. GSA regional offices have established hazardous materials committees to address some liability concerns. A committee is made up of personnel responsible for procurement, storage and disposal within the regional office. The committee's purpose is to ensure that proper precautions are in place so that no harm comes to a federal agency, its employees, or local communities in the transportation or disposal of chemicals.

Chapter 3

DESCRIPTION OF WASTES AND CUSTOMERS OF WASTE EXCHANGES

WASTES LISTED AND TRANSFERRED BY WASTE EXCHANGES

Most exchanges maintain records of number and types of the wastes listed. They do not, however, keep the information in the same format, nor does the information cover the same time period, making it difficult to provide exact totals of wastes listed by category by all of the exchanges in North America. Some of these exchanges are new within the last year and do not have a published record. Some exchanges did not respond to requests for information and others are primarily listing services. In order to get a sense of the types of wastes listed, both available and wanted, we requested a breakdown from the National Materials Exchange Network (NMEN). The figures they supplied were based on the number of listings in the National Materials Exchange Network as of May 19, 1993. They represent most of the listings of the exchanges participating in the network. They do not, however, include listings from the Southeast Waste Exchange (SEWE) and the Southern Waste Information Exchange (SWIX), because they do not participate in NMEN. The figures also do not include exchanges made through direct contacts by exchange staffs which do not result in listings.

Figures provided by NMEN are presented in Exhibit 3-1. These numbers indicate that there are almost three times as many materials available as wanted. In many categories, however, the totals desired are similar to those available. It is clear from the statistics that the number of laboratory chemicals available far outnumber those wanted and that plastics and rubber represent more than a quarter of the wanted listings.

Unfortunately, at this time, NMEN cannot compile statistics on the volume of materials by waste category. Categories such as laboratory chemicals are lower weight or volume materials while metal sludges, wood, and paper, are higher weight or volume materials. Exhibit 3-2 presents a table on percentages of available materials by number and weight from a 1991 study prepared by the SWIX for the 1991 North American Waste Exchange Conference on Industrial Recycling. It illustrates the point that the percentage of the number of listings by category and the percentage of materials by quantity are vastly different. In terms of quantity, over half of the materials listed were classified as miscellaneous, although miscellaneous listings represent only 15 percent of total listings.

Exhibit 3-1

Listings of Materials Wanted and Materials Available by Category from the NMEN* January 1, 1993 to May 19, 1993

Category	Materials Available	Percentage of Materials Total	Percentage of Materials Wanted	Percentage of Materials Total
Acids	197	3%	50	3%
Alkali	181	2%	51	3%
Construction Material	45	1%	27	1%
Container and Pallet 366	5%	79	4%	
Durable and Electronic	32	0%	45	2%
Glass	39	1%	15	1%
Laboratory Chemicals	2,350	32%	8	0%
Metal and Metal Sludge	367	5%	234	12%
Miscellaneous	677	9%	278	15%
Oil and Wax	234	3%	84	4%
Other Organic Chemicals	410	6%	82	4%
Other Inorganic Chemicals	508	7%	97	5%
Paint and Coating	96	1%	11	1%
Plastic and Rubber	826	11%	505	27%
Solvent	313	4%	67	4%
Textile and Leather	165	2%	70	4%
Wood and Paper	594	8%	196	10%
	===		===	
	7,400		1,899	

* These data do not include approximately 460 listings of available materials and 150 wanted listings from the Southeast Industrial Exchange and the Southern Waste Information Exchange based on recent catalog listings.

Exhibit 3-2

Percentage of Materials Available and Quantities Available by Waste Category from the 1991 SWIEC Study on Waste Exchange

Category	Number Available	%	Quantity (metric tons)	%
Acids	271	7	186,506	2
Alkali	280	8	287,090	4
Other Inorganic Chemicals	426	11	541,788	<1
Solvent	326	9	39,127	<1
Other Organic Chemicals	360	10	13,971	<1
Oil and Wax	252	7	67,809	<1
Plastic and Rubber	301	8	230,439	3
Textile and Leather	62	2	31,675	<1
Wood and Paper	313	9	525,047	7
Metal and Metal Sludge	470	14	934,269	12
Miscellaneous	546	15	5,008,486	64
	===		=====	
	3,607		7,866,207	

Comparing the percentage of listings in each category for Exhibit 3-1 and Exhibit 3-2 illustrates the difficulty in analyzing quantitative information from waste exchanges. Table 3-1 is based on a total number of available listings of 7,400 materials in 17 categories in 1993, while Exhibit 3-2 is based on 3,607 listings in 11 materials categories, from 1990 or 1991 data. NMEN has expanded the miscellaneous category into seven categories to accommodate requests from newer exchanges dealing in non-hazardous waste and to divide what was becoming a large category into smaller sections. The data in Exhibit 3-1 excludes two major exchanges, while the data in Exhibit 3-2 excludes listings from new exchanges, including the very active IWRC and CALMAX.

WASTES EXCHANGED

Total exchanges of materials taking place as a result of waste exchange have been estimated to be about 12,000,000 tons. Since many transfers are not documented, this figure is based on an estimate that 10 to 30 percent of materials listed are ultimately transferred. Collecting information on transfers is difficult. Only nine of the exchanges contacted for publicly available information published materials on number of transfers. In addition, the numbers obtained were from varying years; some sent 1990 statistics, while others sent 1991 or 1992 figures.

TYPES OF WASTES EXCHANGED

Examination of catalogs and listings indicate that there are substantial differences in the types of materials listed by region. The Iowa Waste Reduction Center lists a large amount of waste agriculture products, while the Southeast Waste Exchange has a much higher proportion of industrial waste. CALMAX only lists non-hazardous waste and, therefore, has a higher proportion of high volume materials such as wood and construction materials.

Very few waste exchanges publish statistics on transactions broken down by materials category. Therefore, it is hard to generalize about the types of wastes transferred successfully through waste exchanges. Exhibit 3-3 presents the percentages of quantities exchanged by SEWE, IMES, and NIWE, and gives a sense of the regional diversity of types of wastes exchanged.

Exhibit 3-3

Percentage of Wastes Traded by Category (Quantities)

Category	SEWE 1992	IMES 1991	NIWE 1990
Acids	78	< .5	59
Alkali	< .5	8	0
Other Inorganic Chemicals	7	2	1
Solvent	7	< .5	0
Other Organic Chemicals	< .5	1	< .5
Oil and Wax	2	52	< .5
Plastic and Rubber	2	6	5
Textile and Leather	3	1	0
Wood and Paper	< .5	< 1	6
Metal and Metal Sludge	< .5	22	6
Miscellaneous	< .5	7	22

There was no consensus from the waste exchanges contacted for this study about the easiest wastes to trade. There was agreement, however, that material quality was a critically important variable. Issues of purity, volume, and location are as important as the type of waste. The best information comes from the ORTECH report, which ranks the probability of being able to identify markets for different waste categories. According to the report, wastes with the highest probabilities of being traded are metal, glass, thermoplastic, wood, containers, furniture and equipment. The lowest were acids, thermoset, leather, textiles, metal sludges, construction and demolition waste, and lab chemicals.⁸

ORTECH analyzed problem wastes to try to understand why they did not trade. For available wastes, the major reasons for not trading were that the chemical concentration was too low, contamination levels were too high, quantities were too high or too low, location was too far from markets, or no market existed for the material. For wanted wastes, the issues were the same. Companies wanted wastes of high concentration and little or no contamination. Distance and competition from other sources was also a problem, as were volumes requested.

The more active exchanges, including OWE, IWRC, SEWE, and IMES, often suggest ways of avoiding some of these problems to make their wastes more exchangeable. They advise companies on ways to make their wastes more concentrated or less contaminated. These exchanges also try to find more than one buyer for a large waste stream or more than one source of materials for a company wanting more of a material than can be supplied by one generator.⁹

ONE TIME VERSUS ON-GOING EXCHANGES OF MATERIALS

Waste exchanges list wastes available in a certain quantity on a one time only basis as well as wastes which will be available on an on-going basis. For those listing on-going wastes, it is important to find a user willing to commit to taking the waste consistently; otherwise, listing on the waste exchange becomes inefficient. The only information compiled on the percentage of exchanges taking place on an on-going basis is from the Ontario Waste Exchange. It found that 42 percent of exchanges were on an on-going basis and that 90 percent of these were expected to last into the foreseeable future.¹⁰

TYPES OF COMPANIES USING WASTE EXCHANGES

Waste exchanges do not generally release the names of companies listing materials except to parties inquiring about specific materials. Some listers ask that their names and addresses be kept confidential by the waste exchange. In such cases, the waste exchange passes contact information from the inquirer to the listing firm. They then decide whether to make the contact. Confidentiality is an important issue to many companies, who do not necessarily want the world to know about their wastes. Sometimes wastes provide important clues about the processes the company is using or the types of goods they are making. Waste exchange officials know that they must maintain confidentiality in order to attract business.

Representatives of the waste exchanges contacted for this study were not willing to generalize about the types of firms using their services. According to the representatives, the firms range from Fortune 500 companies to gas stations and small repair shops.

The Ontario Waste Exchange provides a good example of the diversity of firms listing waste on the exchange. The organizations listing successfully exchanged materials ranged from a dentist's office with approximately 100 pounds of rigid plastic to a waste management

company listing 6,570 tons of food waste. Waste haulers frequently used the exchange to transfer materials. Hazardous waste haulers listed off-specification and surplus materials, such as animal shampoo, ink, vitamins for animal feed and mineral oil. Brokers accepted these materials, presumably for resale. Over 12 percent of the 122 wastes were transferred to brokers, while about 22 percent went to various types of recyclers and oil re-refiners. Schools and charities also received exchanges of many types of excess materials and old equipment. The Ontario Waste Exchange was able to encourage 14 listers to reuse their own waste in their process.¹¹

According to several representatives of waste exchanges, one of the major difficulties exchanges have in encouraging materials exchange is that the exchanges are relatively unknown among potential users, despite waste exchange marketing efforts. A 1991 survey of 275 Puget Sound businesses conducted by IMEX volunteers found that only 15 percent were aware of the concept of waste exchange and that only one had used IMEX to list waste.¹² Exchanges are frequently marketed through state environmental agencies, trade groups, Chambers of Commerce and through newspapers and trade journals, but they still have a visibility problem. It takes many years to build a business following. The Ontario Waste Exchange reports that 32 percent of their users heard about the exchange from the Ministry of Environment and the Ontario Ministry of Commerce, and 30 percent heard of them from industrial colleagues.

Chapter 4

EVALUATING SUCCESS

This chapter discusses the factors used to evaluate the success of waste exchanges. It begins with a general discussion of the overall goals of publicly operated or funded waste exchanges. Different indicators of success and the factors surrounding their use are described; however, directly measuring success is problematic. The importance of intangible measures of success and some examples are provided in the last section.

WASTE EXCHANGE GOALS

Success of waste exchanges must be measured against clearly defined goals. The progress of the waste exchange towards meeting the goal can be measured. The greater the progress, the more successful the waste exchange.

Generally, the main goals are to encourage and facilitate the reuse or recycling of industrial waste materials in order to conserve resources and reduce the risks to human health and the environment by lessening the amount of waste being treated and disposed. Recycling wastes is a preferred waste management method to treatment and disposal. Recycling conserves natural resources and poses lower environmental and human health risks compared to waste treatment and disposal.

Waste exchanges also have the following goals:

- Providing an opportunity for the exchange of wastes to reduce waste management and raw material costs.
- Educating firms on the potential benefits of avoiding waste disposal.
- Facilitating the recycling of wastes with low market value.
- Providing waste management assistance to small companies.
- Reducing the need to build new publicly funded treatment and disposal facilities.

While these goals are important, most waste exchanges view these as secondary to the overriding goal of reducing the risk to human health and the environment.

MEASURING SUCCESS IS DIFFICULT

A direct measurement of the success of waste exchanges in attaining these goals is not possible for two reasons. First, the relevant data are typically not available. Collecting data and statistics is expensive and labor-intensive. The quality of the statistics and their value in indicating success is dependent in part on the amount of effort expended in their collection. Exchanges, particularly those with low budgets, are not able to devote the resources necessary to collect complete accurate statistics.

Secondly, many waste exchange goals are intangible and difficult to directly measure, even if data were available. Quantifying the reduced risk to human health and the environment is challenging. Linking reduced risk to increased waste recycling brought about by a waste exchange is extremely difficult.

As a result, success must be evaluated through indirect indicators or surrogates. These indicators are used to measure the societal benefit derived from increasing the amount of waste that has been recycled versus treated and disposed.

There are many different indicators for the success of waste exchanges. Quantitative measurements include the number of listings; number of inquiries; and number, quantity, and value of transactions. If accurate, these indicators reflect some of the successes of the waste exchanges. Active waste exchanges could also measure success in terms of the quantity of educational and informational services provided to industry and the public. Success in terms of the waste exchange's ability to generate new markets for wastes and surplus materials is another indicator.

For this study the following indicators were selected for further evaluation:

- Number of listings
- Number of exchanges accomplished
- Ratio of exchanges to listings
- Cost of exchange per ton of waste exchanged
- Number of inquiries
- Savings to business
- Educational and outreach activities

The following section briefly describes each of these indicators and the advantages and disadvantages of its use.

Number of Listings

According to a 1992 survey of 16 North American Exchanges by ORTECH, the number of listings is rated as the number one quantifiable indicator of waste exchange effectiveness.¹³ However, the number of listings waste exchanges report might not necessarily indicate the present potential for exchanges. If the number of listings is an average, or the

number of listings at any one given time, it can include many older listings than have proven difficult to trade. A better measure of waste exchange activity is the number of new listings.

Counting the number of listings is relatively straightforward, making it an easy indicator to track. The ability to draw a large number of listings indicates that the exchange is serving as a forum for companies interested in exchanging wastes. It might also indicate the level of awareness among companies that recycling is a viable waste management option. The number of listings also might indicate that the waste exchange is becoming known within the business community.

Number of Exchanges Accomplished

When an exchange is accomplished, it signifies that a waste material has been transferred from one party to another for the purposes of reuse or recycling. If the data also include the types and quantities of wastes exchanged, this information could be used to indicate the relative level of risk reduction accomplished.

Data on the number of exchanges accomplished is not easily obtained. Waste exchanges normally link companies together by providing them with information which allows them to make contact with each other. The waste exchange does not generally get involved in the actual exchange negotiations, and, therefore, is often not aware that a transfer has occurred. Most companies do not report successful transfers automatically. Waste exchanges often must contact listing firms repeatedly to learn of successful exchanges. Additionally, companies initially connected via a waste exchange might continue to exchange material in the future. If the companies deal directly with one another rather than through the waste exchange, there is no record of these additional exchanges.

The main methods used to document a successful exchange are calls to listing companies, mailing post-cards requesting information, faxing requests, and obtaining information through personal contact with company representatives. The ORTECH survey indicated that, on average, waste exchanges attempt to find out about transfers from about half of listing companies. Three exchanges questioned did not follow-up at all, and two contacted less than 10 percent of their listing companies. On the other hand, three followed up on 100 percent of their listings and four contacted between 75 and 100 percent of the listing companies.

Attempts to follow up do not automatically mean information on transfers is documented. Since waste exchanges often contact the listing companies months after the listings are published, companies often might forget about the exchange, or might forget waste exchange's role in the exchange. In addition, because follow-up is time consuming, exchanges might choose not to contact companies listing small quantities of excess materials or wastes.

The timing of follow-up efforts can make a large difference in the number and quantity of trades documented by exchanges. Companies often report that they are in negotiations when responding to a waste exchange survey. For example, the Industrial Material

Exchange's 1991 survey found that 902 exchanges were under negotiation. In comparison, 98 exchanges were reported in 1991. Because the survey is annual and based on listings in the previous year, these 902 listing companies with exchanges under negotiation will not be contacted later to obtain results. It is likely that many of these negotiations will lead to transfers, but these will not be reported in IMES's annual report.¹⁴ This should not be a major issue if surveys are conducted regularly and more than one year's survey is examined.

Most waste exchange officials agree that the available statistics on number and quantity of transactions facilitated by exchanges are vastly under counted. This reduces the value of measuring the success of a waste exchange solely on the number of transfers reported. Additionally, there is no standard method of recording or tracking exchanges. Waste exchanges have different methods which makes aggregating or comparing statistics difficult.

Caution should be used in trying to directly equate the number of exchanges with reduced risk to human health and the environment. An exchange means that one company transferred a waste material to another firm. It does not necessarily mean that 100 percent of the exchanged waste was reused or recycled. Data on how the waste was actually reused or recycled is generally not available. Without this data it is not possible to determine what percentage of the waste material or what constituents of the waste were actually reused or recycled. For example, foundry sand can contain different metals in various concentrations. The company accepting the foundry sand might only extract one or two of the metals. The remaining metals, and the sand, are then treated as a waste. Another factor is that the reuse or recycling process might generate additional waste.

Ratio of Exchanged Waste to Listings

One way that waste exchanges can measure success is by means of a ratio of exchanges to listings. This represents a transfer rate. It can show a waste exchange which types of listings are more easily exchanged, and which wastes might need more market development. It might help waste exchanges which are actively seeking markets determine where to devote resources. The transfer rate can only be calculated correctly, however, if transfers are well documented.

Cost of Exchange per Ton Exchanged

One way to measure, in relative terms, the efficiency of transfers through waste exchanges is to compare the transaction cost per ton of waste exchanged through waste exchanges to the cost per ton of other means of recycling. The Ontario Waste Exchange estimates the cost per ton of matches made through its services at \$2 to \$3, compared to \$100 to \$200 for Ontario's curbside recycling programs.¹⁵ The IWRC Exchange calculated cost per ton of waste transferred as a result of matches made by them in their first year at less than \$22 per ton (excluding a large transfer of foundry sand), compared to an Iowa curbside recycling program which costs more than \$50 per ton in public funds.¹⁶

Comparing waste exchanges with curbside collection programs illustrates the relative cost effectiveness of waste exchange. The figure is primarily valuable in illustrating that waste exchanges are providing a service at a low cost and a service which, like publicly financed municipal curbside recycling, seeks to keep waste from being disposed. However, comparing a waste exchange and curbside recycling programs is not a perfect comparison. Widespread use of waste exchange to facilitate recycling of household waste is not feasible. Additionally, many curbside recycling programs are required by state or local recycling mandates whereas waste exchanges are typically not established to meet a statutory requirement. Also, very few, if any, curbside programs include industrial and hazardous wastes.

Number of Inquiries

The number of inquiries received by a waste exchange is an indication of how well the exchange is marketing its services. It is partially dependent on the number and quality of listings on the exchange. Exchanges often keep statistics on the number of inquiries by category. This can help them see which types of materials are of more interest, and which materials require more market development.

Savings to Business from Waste Exchange

Waste exchanges collect information on savings to businesses resulting from exchanges in several ways. Many collect "success stories" which describe the materials exchanged, companies or type of companies involved, and an estimate of savings incurred by the businesses. Valuations are usually based on avoided disposal costs by waste generators and the value of the waste product to the users. Success stories can be valuable in marketing the waste exchange and can help the exchanges illustrate their success when fund raising. However, the savings numbers reported can be of varying quality depending on how they were calculated. Exchanges themselves can make estimates of savings, or they can ask the companies for estimates. It is not unusual for companies to underestimate savings or to report "ballpark" figures.

Some waste exchanges try to calculate savings to business not only to enhance marketing efforts, but to measure the effectiveness of the exchange. The valuations are not calculated the same way by each waste exchange, making comparisons difficult. IWRC calculates savings based on the amount companies would have to spend to dispose of the wastes. Therefore, numbers will vary depending on the types of materials exchanged. Savings are based on estimated tipping fees of \$25 per ton for solid non-hazardous waste, \$200 per 55 gallon drum for acids and solvents and \$800 per drum for paints. Calculating avoided disposal costs this way is straightforward and can easily be performed by IWRC staff, with little reliance on estimates by business.

The Southeast Waste Exchange (SEWE) and the Industrial Materials Service (IMES) include the value of materials to the receiving firms as well as the avoided disposal cost. Any payment made by one company to the other for the transfer is included in the estimate. Clearly, in most cases, the waste has some value to the receiving firm, either because it gets

paid to receive it or because it replaces a resource that it would otherwise have to purchase. These values generally take the form of estimates supplied by the companies involved. The methodology used by companies to report savings might not be consistent.

Educational and Outreach Activities

In their effort to increase their markets and to educate businesses about waste reduction, waste exchanges often initiate or participate in conferences or workshops. One measure of success for them is participation from business in these events. IWRC is reporting increasing business interest in its waste exchange seminars. The well-established Southeast Waste Exchange has also had high attendance at recent semi-annual workshops.¹⁷

IMPORTANT SUCCESSES NOT EASILY MEASURED

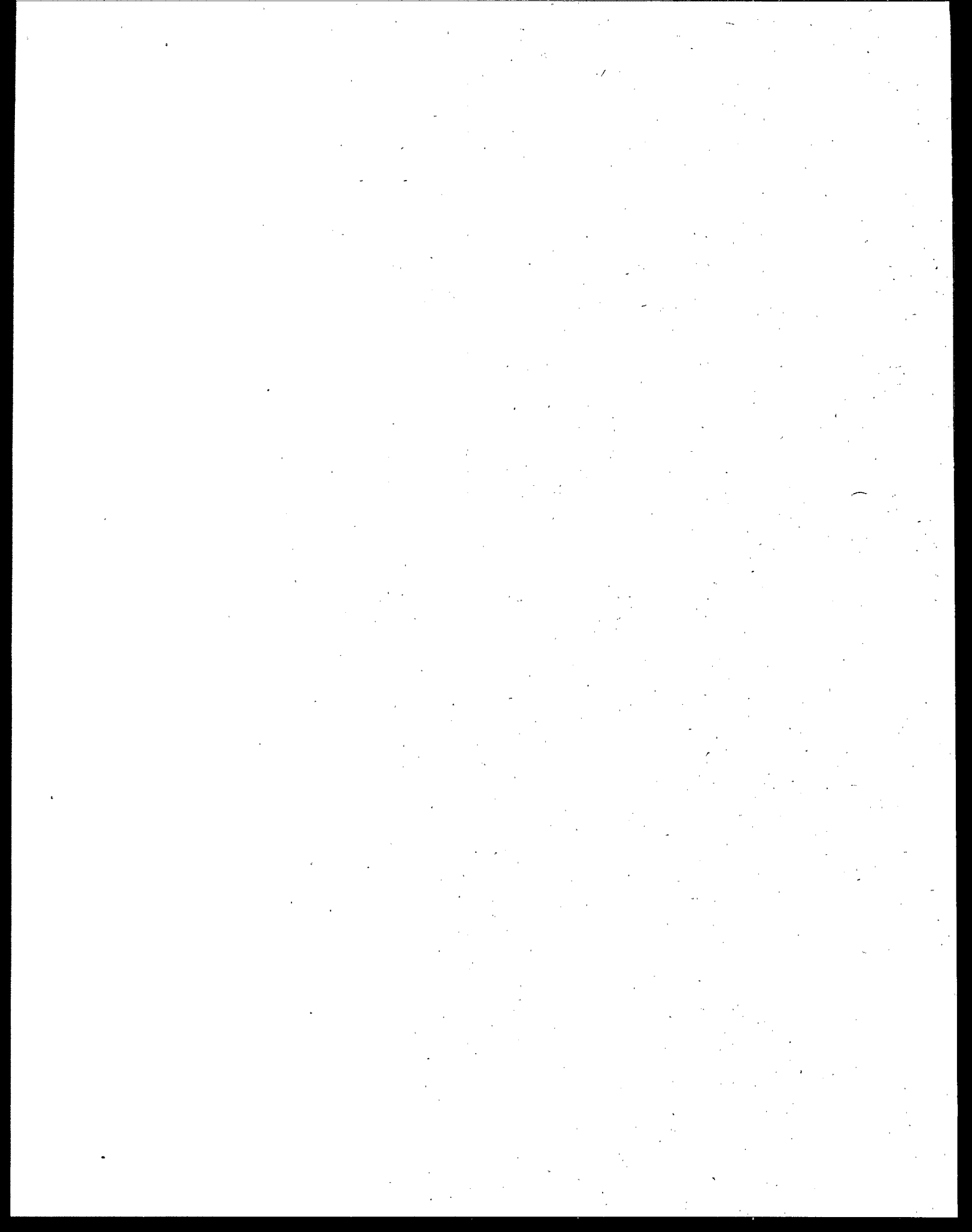
Many exchanges report that intangible successes are as important as quantifiable success in meeting their goals. For example, the Southeast Waste Exchange has a broad mandate to encourage reuse and recycling and to help organizations find alternatives to reduce the economic and environmental costs of traditional waste management programs. They provide advice and seminars on a whole range of waste minimization and recycling subjects and help steer companies to the appropriate regulatory agencies for information. Educating people to reduce, reuse and recycle is as important to SEWE as effecting the exchange of excess materials through the exchange.

One successful project involves the recycling of plastic six-pack containers. At the request of a member of the university community, exchange staff worked with the manufacturer of the six-pack containers to set up a recycling program at the University of North Carolina at Charlotte. This was so successful that the manufacturer has expanded the program throughout the region and from universities all the way down to elementary schools. The value of the program goes beyond the reduction of disposal costs or new materials costs to business. It also serves as an educational program that changes the way children and adults look at waste.¹⁸

Another non-quantifiable way that waste exchanges aid in minimizing waste disposal is to publish advertisements for recyclers, brokers and surplus materials trading firms in their catalogues, usually for a fee. These catalogues go out to large numbers of companies who might decide to contact the advertisers directly. The waste exchange would never hear of the exchange, but through its catalogue, its service would be partially responsible for the transaction.

The exchanges' efforts to assist companies in modifying their waste streams into more readily marketable forms, should not be discounted, nor should extraordinary efforts to trade hard-to-exchange wastes. The existence of these services is important to the overall ability of waste exchanges to reduce the amount of waste disposed, but success is hard to measure.

Intangible benefits of waste exchange accrue to businesses, particularly small generators. Those that are facing environmental regulation for the first time are seeking information and cost effective solutions for their wastes. The types of assistance some waste exchanges provide to small generators, such as finding markets for their waste or helping them rethink how they might reuse waste are not easily measurable. Exchanges generally try to help all organizations with waste problems. They do not discriminate against those with small quantities nor do they discriminate on the basis of waste types. The waste exchange provides a valuable service, including information services, that might not otherwise be available.



Chapter 5

FUNDING MECHANISMS

Waste exchanges currently receive financing from various sources. Some receive public funding from tipping fees, from hazardous waste disposal fees or from general revenues at the state or local level. Several exchanges receive funding through universities or through grants from public and private sources. Exchanges supplement these funds with revenues from listing fees, transfer fees, membership fees, conference and workshop fees, advertisements in catalogs and donations from industry and the public. Some exchanges receive support from Chambers of Commerce and other business groups. Most exchanges operate as not-for-profit organizations.

Waste exchanges uniformly operate with relatively small budgets. The ORTECH survey of 15 North American exchanges reports an average budget of \$106,000 dollars, and a range of \$5,000 to \$200,000 for the ten exchanges answering the question. Information from exchanges for this study indicates that budgets for most exchanges performing more than listing services range from \$100,000 to \$250,000. The annual budgets for all of the waste exchanges currently active in the United States totals less than \$3.5 million dollars.

The ORTECH survey reports that the bulk of funding for waste exchanges comes from governments. Other fees and revenues account for an average of only five percent of the budgets of waste exchanges. Non-government revenue is more critical for exchanges such as SEWE, which seeks industrial support, than for exchanges which are funded from tipping fees or other stable public sources.

The level and stability of funding affects the effectiveness of exchanges. Most exchanges would argue that they are under funded and understaffed. With the exception of IWRC, exchanges are run with four or fewer full time employees. Those exchanges without stable funding must spend valuable time each year tracking down sources of revenue. The time spent securing funding reduces the amount of time the exchange can spend promoting and facilitating materials exchanges. Even those relying on public funds are not immune to budget cuts; CALMAX's budget was cut in half in FY 92. The Northeast Industrial Waste Exchange (NIWE) lost budget support from New York (its largest source of funds), Ohio, New Hampshire, and Maryland, as well as more than a half year delay in receiving its grant from Pennsylvania during 1991 and 1992.¹⁹ Funding difficulties keep staffs small and limit the amount of services exchanges can provide and market. NIWE, for example, lost the support needed for its on-site plant evaluations. Limited staff resources also affect the quality and quantity of statistics, which could provide information about the successes of waste exchanges.

TIPPING AND WASTE FEES

IWRC and CALMAX are funded from tipping fees collected when waste is disposed in landfills. IWRC receives, by legislative mandate, a \$0.10 per ton tipping fee, while CALMAX receives a small portion of the \$0.75 per ton tipping fee which funds its parent organization, the California Integrated Waste Management Board. The Industrial Materials Exchange (IMEX) in Seattle is part of the King County Hazardous Waste Plan and is funded from a surcharge placed on all waste hauling and sewage treatment activities. The IMEX budget is only a small part of the \$9.6 million collected from the waste surcharge.²⁰ The Mississippi Waste Exchange is part of the Mississippi Technical Assistance Program (MissTAP), which is funded by a hazardous waste disposal fee.

Waste fees are currently serving as a stable source of revenue. Ironically, the more successful exchanges become in reducing waste going to landfills, the smaller the revenue to support their program without increases in the fees per ton of waste.

OTHER PUBLIC SOURCES OF FUNDING

IMES (Illinois) and RENEW (Texas) receive most of their funding from general state revenues. IMES is funded through the Office of Pollution Prevention in the Illinois EPA. The Office of Pollution Prevention receives funding from both the state and the federal government. Illinois and Texas both collect tipping and waste fees, but the revenues are not directed specifically toward waste exchange. The Northeast Industrial Waste Exchange (NIWE) still receives some general funding from member states, although much reduced from previous years. Other smaller programs, such as Minnesota's MnTAP (Minnesota Technical Assistance Program) Exchange, receive funding from general revenues.

Grant funding from federal, state, and local governments often contributes to establishing new exchanges, and sometimes remain important as a revenue source as exchanges mature. The IWRC was begun as a pilot project funded by a \$60,000 EPA PPIS (Pollution Prevention Incentives to States) grant. Arizona and Louisiana have recently provided grant money to launch their exchanges. The Arizona Waste Exchange received a \$35,000 grant from the state Department of Environmental Quality to establish the private non-profit exchange. Louisiana's waste exchange is receiving a \$25,000 grant from Louisiana DEQ to contribute to start-up funding. Louisiana State University and its Institute of Recyclable Materials is also contributing funding on a one-time basis.

Another example of public funding is the Southeast Waste Exchange, which is housed at the University of North Carolina at Charlotte. The University pays the salary of the Director and her secretary, and provides space. Other benefits of this arrangement are the ability to use graduate students and professors to perform research or consult on special projects.

Federal funds have been used as grants to start up waste exchanges, such as Iowa's, which was started after a pilot project funded by an EPA PPIS grant. Other federal funds are channeled through state environmental programs into waste exchanges. In addition, EPA has funded the establishment of NMEN with an initial grant of \$350,000.

CATALOG SUBSCRIPTION FEES

Exchanges sometimes charge fees for catalog subscriptions. For many exchanges, printing and distribution fees for catalogs are the largest expenses outside of salaries. Catalogs can cost as much as \$5 per copy to produce. SEWE charges \$25 per year for catalog subscriptions; Pacific Materials Exchange (PME) charges \$48 per year. NIWE instituted a subscription fee, but few paid it; NIWE then cut the distribution of its catalog (previously 21,000) by almost half. The Louisiana/Gulf Coast Exchange is publishing its catalog listings in a business magazine called BIC, in order to receive a large distribution at a reduced cost to the exchange. Even those exchanges which charge for subscriptions send out many catalogs free of charge as tools for marketing the exchange.

LISTING FEES

At least two exchanges charge fees for listing materials. SEWE charges fees of \$50 per year for listing up to 10 materials either available or wanted. NIWE charges listers \$75 per year if they are from a sponsoring state, and \$150 per year if they are from a non-sponsoring state. According to SEWE, companies are not reluctant to pay a limited fee when they realize that the exchange is not funded by the government. Listing fees can help provide a revenue source for an exchange, but they are not a major source of funding. Assuming an exchange has 400 listers, a \$50 listing fee would only generate \$20,000 annually. At its peak, listing revenues for the NIWE amounted to about \$30,000 per year.

TRANSFER FEES

At least two exchanges are charging fees for transfers accomplished using the exchange. Late in 1991, in an effort to decrease dependence on government funding, as well as in response to a decrease in state funding, the NIWE instituted a charge on transactions equalling the sum of 10 percent of the value of the exchange or 10 percent of the avoided disposal cost; the listing fee would be credited towards the cost of the transaction fee. For continuing transactions, the fee would be reduced by half in each of the second and third years, and eliminated in the fourth year. The Arizona Exchange is also charging a fee for successful transactions.

As of the end of 1992, NIWE had collected little money as a result of the transfer fee. Worse, NIWE lost several times the revenue in listing fees (which fell by half) that it gained in

transfer fees; companies dropped their listings in the catalog because they felt the proposed transaction fee reduced the already minimal financial benefit of recycling the materials listed.

The Great Lakes Waste Exchange, one of the exchanges funded by EPA to establish NMEN system, also attempted to charge transaction fees. The effort was financially unsuccessful, however, and in spite of the grant support from EPA, the Great Lakes Waste Exchange is no longer in business.

REVENUES FROM ADVERTISEMENTS

Many of the exchanges, both non-profit and public, obtain revenue from publishing advertisements in their catalogs. This is a limited source of funding, however, because the catalogs are small and are usually only printed bi-monthly. SEWE charges \$300 for a full page advertisement running for a whole year. Based on a review of their catalog and advertisement charges, it is estimated that they receive fewer than \$5,000 from advertisements in catalogs.

Chapter 6

RELATIVE MARKET POSITION OF WASTE EXCHANGES

In addition to waste exchanges, the current reusable or recoverable waste market includes:

- informational waste exchange system which provides information for buyers and sellers who lack their own existing networks
- private brokerage services which buy and sell wastes
- individual corporate networks through which much of the large corporations' recyclable materials are traded.

The relative market strength of individual waste exchanges depends on their geographic situation, their method of operation, and the adequacy of the financial support for their operations.²¹

WASTE EXCHANGES

As noted previously, waste exchanges currently depend heavily on public sector support. Those exchanges which have attempted to find ways to become self-supporting have not experienced success. On the other hand, some waste exchanges have been successful at defraying a portion of their costs through various fees or charges.

The market limitations of waste exchanges, however, are only one part of the recycling picture. Local and state governments, which have established and continue to fund waste exchanges, have found that the recycling market is not adequately efficient in recycling wastes to meet local or state objectives to reduce the future need for additional treatment and disposal facilities. The recent rapid increase in the number of waste exchanges provides evidence that the perceived need for additional stimulation of the recycling market is increasing, not decreasing.

BROKERS

There are, of course, for-profit brokerage companies which specialize in transferring wastes from sellers to buyers. Some of these are very successful. They have a substantially different role in the marketplace than waste exchanges. Brokerage operations tend to specialize in particular commodities or waste streams. Because they are operating on a for-profit basis, a major consideration is the relative value and profitability of the materials in which they specialize. In addition, by focusing on relatively narrow market niches, they develop expertise on the materials in which they trade, including: the processes which produce or utilize those materials, their chemical and physical characteristics, and the companies which

need to dispose of or obtain those materials. Many operate on a national basis. Brokerage companies often specialize in unused surplus chemicals, solvents, precious metal wastes, and heavy metal sludges. The Canadian Chemical Exchange, for example, deals primarily with off-spec or overstock virgin chemicals, dyes, pigments and pharmaceuticals. Some brokerages specialize only in overstock chemicals resulting from plant closings.

The nature of such for-profit operations implies certain restrictions. Small, complex, or heavily contaminated waste streams are likely to involve too much risk and too little profit to be worth handling. Waste streams with recoverable or reusable materials which are inexpensive in their virgin form provide too small a potential margin of profit. Further, a waste stream falling outside the usual realm of expertise of the company will generally involve transaction costs which are too high (because of the need to spend more time identifying potential markets or sources) for the potential financial return. Therefore, there are large sectors of the waste stream which are of interest to generators and to the public (e.g., because of increased demand for landfill space) but which are unlikely to be handled by brokers. There are also limitations in the roles that brokers can play due to concerns about liability.

The value of brokers in the marketplace is their specialized knowledge of markets and sources for the particular materials in which they trade. Brokers usually operate in one of two ways to protect the market value of their knowledge. First, they might actually purchase and sell the material, taking legal possession, though usually not physical possession, of the material. While they will provide a complete analysis of the physical and/or chemical characteristics of the materials they are selling, they will often not inform either the seller or the buyer of the identity of the other party. Such an approach can make transfers of any hazardous wastes very risky for all parties including the broker, and significantly limits the degree to which brokers are likely to involve themselves in recycling hazardous wastes. For most generators, not knowing the ultimate buyer and user of a hazardous waste is likely to be equally unacceptable due to liability concerns.

The second mode of operation for brokers is to serve as the middleman, but not to actually buy or sell the waste. The broker will obtain non-circumvention agreements from both parties prior to introducing buyer and seller, including a guarantee of a fixed percentage or price per unit of the materials sold. This mode of operation is most common for smaller brokerage operations dealing with high-volume, high-value commodities (e.g., natural gas). While this would be a more viable approach for trades involving hazardous wastes, since the seller would be able to determine the security or liability risk of sending such wastes to the potential buyer, it creates a long-term risk for the broker of being cut out of future transactions (although some brokers have long-term and/or exclusive contracts with their buyers).

CORPORATE SECONDARY-MATERIALS MARKETING

Large corporations have become increasingly sensitive to the costs of disposal and the potential risk of liability due to the wastes they generate. Pollution prevention has become a major strategy for reducing wastes requiring treatment or disposal. For those wastes which

are generated, however, determining potential reuse options and locating marketing is important. To the extent that these materials are large-volume and routinely generated, large companies have tended to develop their own networks and markets. Where the wastes are hazardous, corporations will either have their own audit teams determine that the risk of future liability from recycling to an external source is minor, or will treat and dispose of the materials.²²

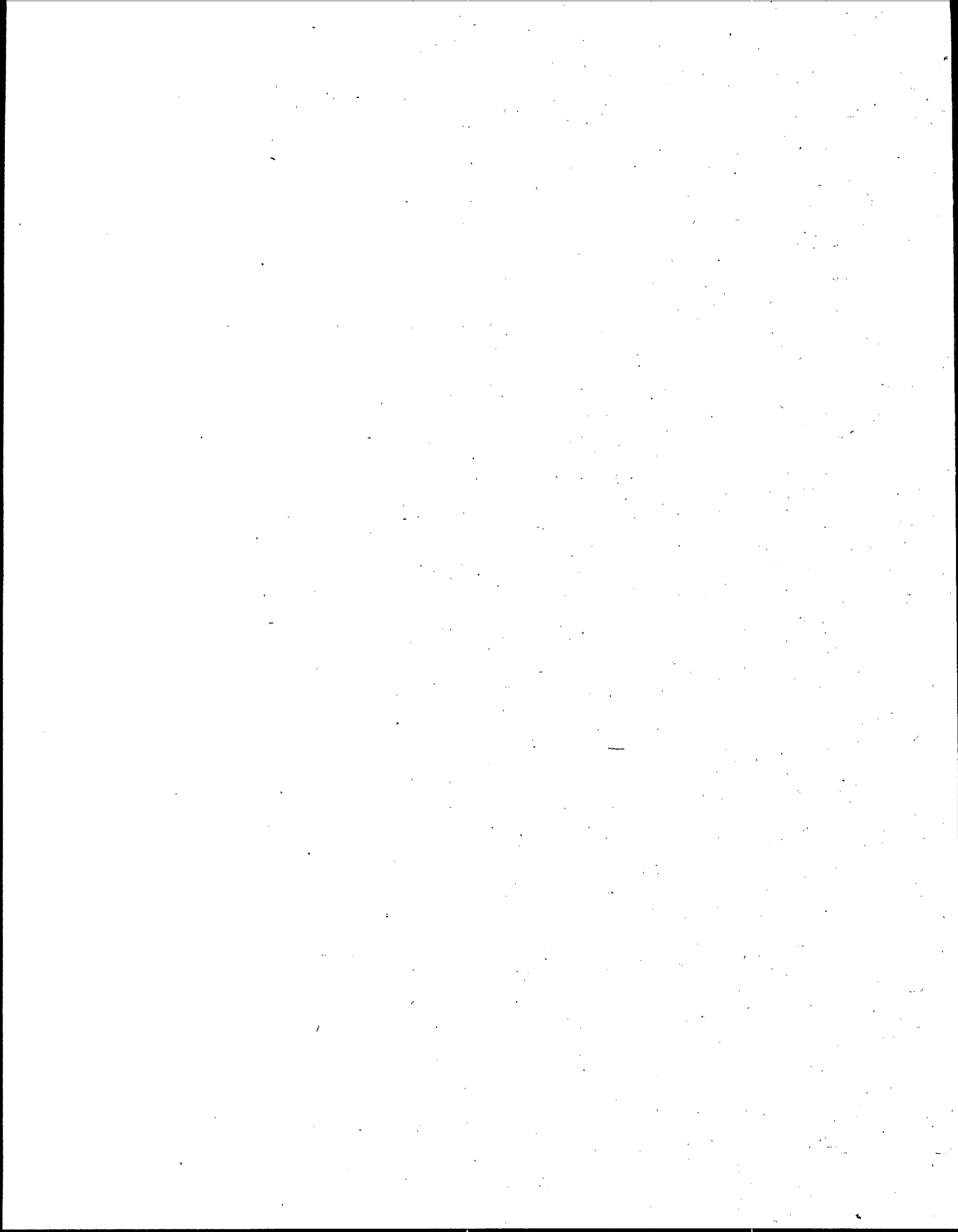
Even for those wastes which are neither hazardous nor routine, there are limitations to the roles which waste exchanges presently play. The time required for transfers through the waste exchange are often longer than large companies are willing to wait. NMEN, of course, has only just started (January, 1993), and could help to facilitate greater utilization of waste exchanges by large corporations.

RELATIVE MARKET STRENGTHS OF INDIVIDUAL WASTE EXCHANGES

Public and non-profit exchanges generally do not discriminate as to type, purity or size of waste streams. They list just about all wastes, thus playing a role in the marketplace for generators that is not presently played by brokers. Because the exchanges deal with all kinds of wastes, and because they are extremely small, they lack the specialization of brokerages. As noted previously, there is a regional variation in the materials listed on exchanges. While they might provide a service to, and work cooperatively with brokers, their ability to serve generators in their service areas is limited by their ability to develop a significant and economically viable market role similar to that of the brokers.

Competition from other exchanges is a major concern for exchanges relying on private funds and grants, and for exchanges which serve a large regional role (SEWE, SWIX, PME, NIWE). Those exchanges with state funding from tipping fees (IWRC, CALMAX) or with funding from other stable state revenues (IMES, RENEW) seem unconcerned about competition. Competition does affect PME, which began in 1988, just before IMEX. IMEX is located in the industrial region of the state of Washington. PME's industry base in eastern Washington, northern Idaho, and western Montana is too small to support a non-profit exchange. IMEX's services are funded through a waste tax and are free, while PME has to seek industrial support and grants.

Questions about the ability of new waste exchanges to enter the market could be somewhat misleading, if this is put in the usual market context of for-profit organizations. Evidence in recent years gives little reason to believe that waste exchanges serving a broad role in recycling wastes of all kinds could be financially self-sufficient. On the other hand, additional waste exchanges might be able to better facilitate the marketing of wastes which would otherwise go to disposal. The addition of numerous waste exchanges in the last year indicates that states regard them as serving a market need, even if that need can only be met through state funding. The existence of NMEN might be a factor in these additional start-ups, since many of these exchanges can take advantage of the existence of a large listings base and the ability to manage listings using NMEN service and database.



Chapter 7

WASTE EXCHANGES AND ENVIRONMENTAL LIABILITY ISSUES

One of the key disincentives to the use of waste exchanges in the United States is the fear of incurring legal liability under one or more environmental laws. This section presents a general overview of the liability concerns under RCRA and CERCLA associated with the use of waste exchanges, from both the exchange's and the user's perspective. The information is based on review of articles²³ and summary materials,²⁴ not a summary of pertinent case law. As such, the findings presented below should be viewed as preliminary.

Waste exchanges and users of waste exchanges face potential liability under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), and common law theories, commonly known as "toxic torts." Potential liability under these laws depends on the nature of the material being managed (i.e., whether the waste is a "hazardous waste," "hazardous substance," or is toxic in nature), the actions of the parties, and the results of those actions. For purposes of this discussion, it is presumed that waste exchanges function in a role where they:

- arrange for contact between a party wishing to transfer a waste/secondary material and a party wishing to obtain such materials.
- do not take possession of the waste (i.e., no control, storage, etc.).
- do not transport or arrange for the transport of the waste material.

In addition to these assumptions, several other observations are worth noting. Most waste exchanges are private entities, although the government, at various levels, is increasingly becoming involved in waste exchange operations. In addition, although most of the materials that are managed through waste exchanges today are non-hazardous, some exchanges do manage hazardous wastes.

RCRA LIABILITY

RCRA regulations identify those wastes that constitute "hazardous wastes" and impose specific regulatory requirements on hazardous waste generators, transporters and treatment, storage and disposal facilities. These requirements are designed to ensure that such wastes are properly managed and tracked at each point between generation and disposal, thereby ensuring protection of human health and the environment.

Upon applying RCRA requirements to waste exchanges, it appears that the waste exchanges are not subject to RCRA liability if they do not generate, transport, treat, store, or

dispose of hazardous wastes.²⁵ As noted above, waste exchanges do not possess or actively manage the wastes they list and, thus, they do not generate, transport or otherwise manage hazardous wastes. From the perspective of a waste exchange, the most significant aspect of the RCRA hazardous waste regulations is that RCRA "hazardous wastes" are defined as "hazardous substances" under CERCLA (CERCLA liability is discussed below).

In contrast to the lack of direct RCRA regulation of waste exchanges, such regulations do potentially impact individuals or corporations that use waste exchanges (i.e., waste generators and recyclers). Under the hazardous waste rules, hazardous waste generators are subject to manifest, pre-transport, record-keeping and reporting, and certain land disposal restriction requirements. In addition, if a generator stores hazardous waste on-site for more than 90 days he/she must obtain a RCRA permit. Therefore, many hazardous waste generators are interested in ensuring the disposition of their waste as quickly as possible, which is not always compatible with the use of waste exchanges. RCRA regulations also contain complex provisions applicable to the recycling of hazardous wastes. Under these provisions, many secondary materials being recycled continue to be subject to regulation when transported, stored, treated or disposed of (the recycling process itself is generally not regulated, with certain exceptions). Thus, recyclers that might accept wastes from wastes exchanges must understand these rules and be capable of complying with them. Some of the requirements, such as the permit and corrective action requirements, can be extremely burdensome. In addition, penalties for violating these requirements are substantial. Products generated through hazardous waste recycling are generally not regulated (again, some exceptions exist), however, wastes might be regulated as hazardous under the mixture or derived-from rules. Such wastes must be treated and disposed of in compliance with land disposal restriction treatment requirements as well as technical RCRA disposal requirements.

To summarize, waste exchanges do not appear to be subject to significant potential liability under RCRA because they do not generate or manage hazardous waste. However, the generators and recyclers that use waste exchanges might be reluctant to become involved in the exchange of hazardous waste due to their lack of confidence that such transactions will be conducted in compliance with the requirements of RCRA. The technical nature of these requirements (which often results in a lack of understanding regarding compliance and liability), severe penalties, stigma associated with hazardous waste, and remaining CERCLA liability for listers might outweigh economic gains that can be achieved by reusing wastes through exchanges.

CERCLA LIABILITY

CERCLA imposes liability for the cleanup costs, response costs, and damages to natural resources upon specific persons associated with the release of hazardous substances into the environment. Hazardous substances are specifically defined in implementing regulations and include, but are not limited to, those wastes that are RCRA hazardous wastes (See, 40 CFR §302). It is important to note that non-hazardous wastes might also constitute

hazardous substances where they contain compounds or constituents listed as hazardous substances. CERCLA response cost liability might be imposed upon:

- owners and/or operators of a facility that is releasing or has released hazardous substances to the environment.
- persons who arranged for the treatment or disposal, or the transport prior to the treatment or disposal, of hazardous substances owned or possessed by such person (i.e., the generator of the hazardous substance).
- persons who accept or have accepted hazardous substances for transport to disposal or treatment facilities or sites selected by such persons.

CERCLA was enacted to empower the federal government so that it could respond to releases of hazardous substances and to clean up inactive or abandoned dump sites. The Act imposes a standard of strict liability (i.e., no element of fault must be proven) in combination with joint and several liability (i.e., any legally responsible party can be held liable for all cleanup/damage costs imposed). This combination, when linked to the extensive list of hazardous substances regulated, has dramatically increased the potential liability encountered by anyone managing hazardous substances.

Applying these provisions to a situation where a waste contains a hazardous substance and is being transferred via a waste exchange, several observations can be made. If, as noted above, waste exchanges do not take ownership or possession of the waste, they do not appear to be subject to CERCLA liability. This is a result of the general requirement that a person "own or possess" the waste in order to incur liability. However, no specific research has been conducted regarding the precise meaning of the terms "own or possess" under CERCLA, and thus, absolute conclusions cannot be drawn. Traditionally, ownership is indicated by the holding of legal title, and possession by physical control or management. Where an exchange does take possession or ownership of the waste, it is plausible that they could be subject to CERCLA liability. This result could occur if reuse of the waste is viewed as disposal or treatment under CERCLA or where some of the waste is ultimately treated or disposed. Again, additional research would have to be conducted to determine how these terms have been interpreted.

Persons that generate hazardous substances are clearly subject to CERCLA liability because they arrange for the transport, disposal, and treatment of their waste. Generators have sought to avoid CERCLA liability by claiming that they were selling such wastes (i.e., that the waste comprised a product). Such arguments have generally been rejected by the courts, although at least one case agreed with this argument. Thus, there might be a legal line of demarcation beyond which reuse is sufficiently commercial to avoid generator (and recycler) liability. Additional research would be needed to clarify this issue. Note that since RCRA hazardous wastes are defined as hazardous substances, all RCRA generators are potentially subject to CERCLA liability.

Potential users of transferred wastes will also be subject to CERCLA liability where any of the waste they are managing is treated or disposed (because, by necessity, they must own or take possession of the waste as part of the recycling process). Where none of the waste is treated or disposed (i.e., all is recycled), the question arises as to whether different forms of recycling meet the definition of treatment or disposal under CERCLA. As noted above, the meanings of these terms as applied under CERCLA have not been researched for this task. Finally, products are generally not defined as hazardous substances.

To summarize, where a waste exchange does not "own or possess" the waste at issue, it is unlikely that they would be subject to CERCLA liability. However, generators of hazardous substances are clearly subject to CERCLA liability. As a result, they are very concerned about who receives their waste and how that entity manages the waste. This is because mismanagement of the waste that results in a release or potential release to the environment might subject the generator to considerable liability. Users of transferred wastes are also subject to potential liability if they treat or dispose of any of the waste, or if their recycling process is defined as treatment or disposal for purposes of CERCLA.

Chapter 8

ROLES OF WASTE EXCHANGES

ROLES OF WASTE EXCHANGES

In reviewing the various waste exchanges, there appear to be a number of unique roles. Possible roles are discussed in this chapter and include:

- providing information to identify potential trades
- facilitating generators access to the appropriate recycling market.
- facilitating the reuse of complex, unusual, impure, smaller volume and/or low value wastes or secondary materials.
- facilitating the development of new markets for waste materials.
- providing education and/or technical assistance with respect to reuse and recycling options.
- relating recycling to other available options (e.g., source reduction).

Providing Information to Identify Potential Trades

Providing information is the basic function of most waste exchanges, and, in many cases, the only service provided. Information can be provided through a catalog or an on-line system. The system could involve only a few listings, or many. It could be supplemented by technical support or just identify possible contacts.

A national system, such as NMEN, clearly has the capability to broadcast the information on wastes needed and wastes available to a much greater audience than local exchanges and thus has the potential to improve the market-value of the information. On the other hand, some exchanges are only viable within limited geographic areas, either because of size or cost of waste transport. The existence of NMEN, however, can help to reduce the administrative and maintenance costs, even for locally-based exchanges.

Matching Buyers and Sellers

Another role for waste exchanges involves direct efforts to match buyers and sellers. This might involve either active efforts by exchange staff to find a specific match for a waste, or efforts to link generators with possible buyers with whom they could work in the future.

A more proactive approach could involve outreach to appropriate industries to attempt to find, or generate interest in, a particular waste stream, either on a one-time or long-term basis. Finally, exchange staff might use available state data (e.g., on waste generation) to identify targets for direct marketing outreach about recycling opportunities. The Iowa, Illinois, and Ontario exchanges all have staff whose role includes this kind of continual outreach and exploration.

Any version of this role is more costly than simply providing a listing service. The more proactive the approach, the more staff is required, and the higher the costs are to maintain the exchange. However, from the perspective of sponsoring state or local governments, the benefit of such an effort to reduce disposal costs by recycling as wide a variety of waste streams as possible might be seen as necessary.

Facilitating Reuse of Wastes as Secondary Material

Waste exchanges tend to handle a significant proportion of waste streams which are difficult to trade. Assuming the higher estimate from the 1991 SWIX study, only 30 percent of wastes listed with an exchange are traded, meaning that as much as 70 percent of the wastes listed eventually require treatment or disposal. Management of a database with such a high percentage of materials which are not traded means that a significant portion of administrative and/or marketing time is used for waste streams with limited exchange potential. From a sponsoring state or local government perspective, however, this can be an appropriate and necessary part of the exchange's activity; it also might be critical for some of the smaller businesses in the exchange's service area.

Facilitating Market Development

Finding and developing new markets for potential waste streams, or identifying new companies to bring into the recycling market, is an on-going activity for a proactive exchange. The potential market is not finite or stable; there are continual changes both in the wastes to be traded, and in the companies involved. Exchange staff who spend considerable time in the field need to continually research new technologies and new markets, both to identify new waste sources and new potential users for existing waste streams.

Providing Education and/or Technical Assistance

Several of the more proactive waste exchanges provide a variety of educational outreach and technical assistance services. For instance, SEWE provides workshops on recycling for companies in its service area. IWRC and IMES provide on-site evaluations of recycling opportunities at plants. These services are free, and are meant to maximize educational impact and service to industry. They are similar in approach to services offered through state pollution prevention technical assistance programs.

Relating Recycling to Pollution Prevention and Other Waste Minimization Options

Another role of waste exchanges is to tie the activities of the exchange to related efforts of other agencies. For instance, staff at some waste exchanges look for waste reduction possibilities and/or refer the company to the state pollution prevention technical assistance office following site visits. For companies having a hard time finding a market for a waste, some waste exchanges explore options for internally reducing the waste stream. In some cases, there are strong and direct ties between the waste exchange and the pollution prevention office. Specifically, waste exchanges in Texas, Illinois, Minnesota and Iowa are part of the state pollution prevention office. SEWE also has strong ties with the North Carolina pollution prevention office. Another example is the effort of IMEX to work with DRMO at Fort Lewis. Tying together the exchange efforts of the non-federal waste exchanges to those of DoD offers a major opportunity to expand the effectiveness, market size and market attractiveness of the exchanges.

FACTORS INFLUENCING SUCCESS/FAILURE

As noted in Chapter 4, one of the difficulties in defining whether an individual waste exchange is successful, or whether waste exchanges in general are successful, is finding an appropriate measure for success. If the measure of success is that waste exchanges should become financially independent of government support, there appear to be no current successful exchanges. Those organizations which have made trade in wastes a successful self-supporting business limit their activities to selected waste types, qualities and volumes.

Even the largest waste exchanges are relatively small organizations with limited budgets. There were numerous waste exchanges identified in EPA's 1980 report, but very few of today's waste exchanges have even a ten-year track record. Even one of the two waste exchanges funded by an EPA grant to establish the NMEN system has since failed. Not all the factors providing a higher probability of success are within the control of individual waste exchanges.

Budget stability is the least controllable, though it can significantly depend on other factors. If waste exchanges are unlikely ever to be entirely market-based and self-sufficient, they will be in need of state and local government support. A sufficiently severe budget crisis could undercut even a strong, service-based organization. When New York faced its budget crisis, not only did NIWE lose its support, but the state's pollution prevention technical assistance office in the Environmental Facilities Corporation (one of the oldest technical assistance programs in the country) was placed on a fee-for-service basis.

The waste exchanges which have achieved greater stability, however, appear to be those which have filled more of the roles for waste exchanges identified above. Waste exchanges which provide education, technical assistance and other support for businesses which assist companies in identifying and maximizing exchange opportunities seem to be the most successful. The two oldest current North American exchanges, OWE and SEWE, both

provide some of those services. (State pollution prevention technical assistance programs (TAP) have often found that, when state budgets are being cut, businesses in the state become important allies. Where the TAPs have developed strong working relationships with companies, the companies do not want to lose useful services.) This does not mean that exchanges should not seek other sources of funds, only that some of the more important services of a waste exchange are likely to continue to require government support.

Chapter 9

FINDINGS AND RECOMMENDATIONS

GENERAL FINDINGS

Current Operations

The number of waste exchanges is growing rapidly. In addition to the 42 waste exchanges already participating in NMEN and the two known non-participants, there are at least 9 additional waste exchanges operating in North America. The majority of these exchanges appear to be information exchanges providing a place to list available or needed wastes.

For most of the newer or smaller exchanges, it appears that a national bulletin board could play an important role in reducing some of the administrative burden of maintaining and/or publishing a separate listing system. Thus the opening of NMEN in January 1993 might be a factor supporting the increasing number of exchanges.

The largest operating exchanges are those serving federal agencies, operated by DoD and GSA. At present, there is little interaction between the non-profit exchanges serving state and private sector interests and the federal exchanges. Information on the federal exchanges, for example, is not listed on NMEN nor is information from NMEN incorporated into the federal system.

Until recently, there appeared to be a trend towards a few regional exchanges serving the needs of the states in fairly wide geographic areas (e.g., NIWE in the northeast, IMES in the midwest, SWIX for the south coast). But this now appears to be changing with the proliferation of individual state exchanges. This could be due to the availability of the national database or to the perceived inability of regional waste exchanges to adequately serve the needs of individual states. The future relationships of these exchanges are still evolving.

Types And Amounts Of Wastes Transferred

Information on volumes of and types of wastes transferred through exchange operations are difficult to estimate, since exchanges tend not to have the resources to either gather or verify such information. However, a 1991 SWIX study showed almost eight million metric tons of waste materials available through listings on waste exchanges, based on 3,607 listings (Exhibit 3-2). Data from NMEN in 1993 indicates more than twice that number of listings, without indicating tonnage. Percentage estimates of listings which result in trades are also unreliable, since most exchanges do not systematically track transactions; however, the 1991 SWIX study estimated between 10 percent and 30 percent of listed materials are traded.

Typical wastes transferred include plastics, solvents, acids, alkalis, wood and paper, metals and metal sludges (see Exhibits 3-1 through 3-3). Most exchanges estimate that a substantial majority of their transactions are for non-hazardous rather than hazardous wastes. Some of the older exchanges indicate that there has been a continuing trend in that direction, perhaps due to the regulatory and liability issues surrounding the recycling of hazardous waste, or the related economics of hazardous waste transfers.

As noted in Chapter 6, data to estimate the percentage of the recycling market served by waste exchanges were not developed during this study, and would be difficult to estimate due to the lack of adequate transaction information maintained by the exchanges. The percentage of wastes transferred through exchanges might be small, but it is likely to include a disproportionate amount of difficult-to-transfer wastes (e.g., small volume wastes, wastes from small companies with limited market access and information, complex, contaminated or unusual wastes, and wastes with little or no market value). These are the waste streams for which other market systems for transactions are likely to be unavailable or ineffective.

Funding

Most waste exchanges operate with very limited budgets; an average of slightly over \$100,000 per year with a total for all waste exchanges of about \$3.5 million per year. While there are no reliable figures on which to base total transfer volumes, it seems likely that the average cost per ton figure might be well under \$10 per ton (see transfer estimates in Chapter 3).

Waste exchanges are largely dependent on budget support from federal, state and local governments, either through direct budget outlays, grants, indirect support through universities, tipping fees or other mechanisms. Some exchanges have defrayed their expenses through fees for catalogs, listing fees, or grants from industry. Efforts to exist totally independent of government funding have not been successful.

EPA has provided support for the non-federal waste exchanges both through the funding of NMEN, and through grants to develop support individual waste exchanges or specific waste exchange activities. For example, the Iowa waste exchange was started with funds from a PPIS grant from EPA's Pollution Prevention Division, and NIWE received a grant from EPA's Industrial Solid Waste Branch to evaluate opportunities for recycling of foundry sands.

Benefits To Participants

The roles and modes of operation of waste exchanges vary significantly. Some are primarily listing systems. Others are actively involved with the industries in their geographic areas, providing outreach and education services to make companies aware of the benefits and opportunities of recycling, providing on-site assessments of recycling or waste reduction opportunities at plants, and working closely with state pollution prevention technical assistance

programs. Some have their own electronic bulletin board systems, while others have no computerized system or catalogs.

There are strong incentives for companies to pursue, and for states to promote, recycling of materials that would otherwise require treatment or disposal. Even with waste reduction as a priority, there will still be a continuing need for resource recovery and reuse. For companies, the advantages of reuse and recycling are fairly straightforward. The seller can reduce disposal costs and/or increase profits from the sale of recoverable materials. The buyer, if quality needs can be met, can lower raw material costs by using waste material as substitutes for virgin materials.

While the services of waste exchanges are either low-cost or free to the user, the use of waste exchanges by companies will depend on whether the exchanges can provide better, more efficient market access or alternatives than are otherwise available. For some smaller companies, waste exchanges might be a primary source of access to a needed recycling market. For larger companies, the issues are likely to be the size of the market accessible through an exchange and the speed with which possible sources or markets can be identified.

Benefits To State/Local Governments

For state and local governments, there are direct benefits to increased support for waste exchanges. Supporting waste exchanges has the potential to provide a low-cost method to promote reuse and recycling (some waste exchange programs have budgets as low as \$10,000). In addition to reducing disposal costs, an active recycling/waste exchange program can benefit state and local economies. Promoting reuse and recycling through waste exchanges can also help to reduce the demand for new landfill and waste treatment capacity. Further, by establishing a waste exchange, a state or local government can demonstrate its willingness to provide a favorable atmosphere for business.

There are, however, some cost tradeoffs involved. For instance, all of the roles described in the preceding section cannot be met with budgets as low as \$10,000. Waste exchanges with restricted budgets and extremely limited services might not provide significant benefits to the business community. Adding the capabilities which can lead to real service by an exchange, such as on-site assistance at plants and proactive, knowledgeable assistance in targeting waste streams for reuse and recycling, can increase the impact on severely strained budgets. Even the largest exchanges identified in this study have annual budgets slightly in excess of \$200,000 which, if the exchange were effective, could be a bargain compared to avoided waste management costs and/or the benefits of support to local companies.

SPECIFIC FINDINGS

The following are some of the specific findings from the review of non-federal and federal waste exchanges.

Non-Federal Waste Exchanges

- The expectation that waste exchanges can become self-sufficient is unrealistic. Many of the materials listed on exchanges are low value wastes. Even if listers were willing to pay a minimal fee, an exchange would have to have 4,000 organizations listing materials for a \$50 fee in order to raise \$200,000; enough to fund a staff of two or three people. The largest waste exchanges currently have far fewer than 1,000 listing companies.
- Waste exchanges provide listing services at very low cost. Exchanges facilitate materials transactions at costs as low as \$10 per ton.
- Waste exchanges have increased their effectiveness through increased interaction with waste generators, either through technical assistance program tie-ins (workshops, conferences, on-site assistance), regional representatives visiting potential users, or aggressive telemarketers. Many of the more proactive waste exchanges have staked out roles as market developers by finding uses for hard-to-move items and shifting resources to unusual trades.
- Some state-funded exchanges (CALMAX, IWRC) are relying on tipping fees as major funding support. This ties them into state solid waste reduction goals and gives them an element of stability (both funding and purpose).
- The existence of NMEN is helping to stimulate the development of new state and local exchanges, many of which are being started at reduced cost because they have access to the large NMEN database and can use NMEN software to manage their own records.
- For most of the exchanges, hazardous waste is playing a lesser role than non-hazardous waste, particularly in terms of the number of actual trades. Many of the hazardous waste listings merely get carried-over from catalog to catalog. Liability is the largest barrier to hazardous waste transfer.

Federal Waste Exchanges

- The federal waste exchanges (DoD, GSA) could provide a major impetus to the growth of a national waste exchange market by sharing listings with NMEN at the national level and working cooperatively with the individual exchanges near military bases and other federal facilities.

- Until a more complete linkage can be developed between federal and non-federal exchanges, non-profit and state waste exchanges can offer a valuable service of their own to these federal programs. The public does not have direct access to either the DoD R/T/D Program or GSA Utilization and Donation Department databases. Local exchanges could provide information on items available at federal auction. Publicizing auction dates will provide greater visibility for the government's surplus items and generate greater interest in public auctions.
- The change to the use of computers for tracking items available for transfer has increased the efficiency of GSA transfers substantially.
- As with the non-federal waste exchanges, the key factor to success in the federal exchanges appears to be a proactive approach to transfers and sales, including knowledge of sources and potential recipients of materials, as well as knowledge about the materials transferred.

RECOMMENDATIONS

Based upon the research conducted for this study, the following recommendations were reached regarding possible mechanisms to encourage the recovery of industrial wastes.

- Consider ways to limit concerns over liability and clarify regulatory issues regarding recycling and reuse of hazardous wastes. The exchange of hazardous materials will always need to be regulated to protect public health. Waste exchange transactions will grow if liability is transferred with the material in an exchange where good-faith is exhibited. Criteria outlining procedures for carrying out a good-faith exchange could be developed that would have to be followed, documented, and approved in order to transfer liability. It may also be necessary to guarantee that the receiver of the hazardous material is in a financial position to be responsible for it and/or has a clean accident record and practices good materials handling.
- Consider continued support for NMEN, in whatever location, so that it can be allowed to develop to its fullest potential. While it is not a substitute for a geographically localized exchange, it does offer the potential of a larger market than would be available regionally or locally. In addition, many of the new and developing exchanges are depending on it. PME is attempting to make the system easier to use and is working on more software which will help exchanges work with the system more efficiently.
- Consider alternatives to support the development/continuation of model waste exchanges; waste exchanges which fulfill the range of objectives and roles which it considers to be appropriate. As discussed in the previous chapter, this might include a proactive approach to promoting recycling, integrating waste exchange efforts with pollution prevention technical assistance and/or economic development efforts of a

state, educational outreach, or other factors EPA considers important. EPA could promote the development of such waste exchanges through limited competitive grants, or through the development of recommended roles which could be the basis for state requests through other federal grant programs.

One additional consideration might be that the waste exchange model should include some method through which the provision of waste exchange services can be market-tested to avoid the bureaucratization of waste exchange services. Possible examples might include a competitive approach, such as that utilized in Iowa (see Chapter 3), or a requirement that the waste exchange receive a certain proportion of its funds from non-governmental sources (fees, private-sector matching funds, or other alternatives). If EPA were to provide competitive grants, waste exchanges could be encouraged to propose their own models for market-testing their services.

- Encourage the integration of NMEN and Federal waste exchange information systems (DoD and GSA). This could involve sharing listings and promoting exchanges in both directions. One advantage of such an integration is that it would create a much larger transactions marketplace, and thus create a magnet for increased private sector participation in NMEN. Among the issues requiring resolution would be ensuring compatibility between Federal procurement rules and the way in which NMEN and individual waste exchanges are used for advertising available waste or hazardous materials.
- Consider additional ways to promote the visibility of waste exchanges, and of NMEN, within the business community and with trade groups.
- Consider reviewing, through associations or with companies, the hazardous wastes that are transferred through waste exchanges. Such a review could try to determine who is making the trades, and the types of wastes which can be most effectively transferred via waste exchanges in spite of the potential regulatory barriers. If appropriate, this information could be publicized through the exchanges to promote greater recycling, rather than disposal, of hazardous wastes.
- Consider developing tools to help waste exchanges track transactions and other activities.

NOTES

1. Materials received from Bob Smee, PME, NMEN, 5/19/93 and phone conversations with Bob Smee on May 1, 1993, June 21, 1993.
2. Phone conversation with Diane Shockey, IMES, June 14, 1993.
3. Materials received from Joyce Mason including California Integrated Waste Management Board Planning Committee, March 2, 1993 Agenda Item #4; Article by Joyce Mason entitled "The California Materials Exchange(CALMAX): Companies Swap Waste, Lighten Landfills" to be printed in Current Municipal Problems, Summer 1993; CALMAX "Materials Listings Catalog", March/April 1993; and phone conversation with Joyce Mason on June 6, 1993.
4. Texas Water Commission, "Resource Exchange Network for Eliminating Waste : 1990 Annual Report" February 1991; RENEW "Catalogue Listings", April 1993; RENEW's "Blue Card"; RENEW Fact Sheet; and Phone Conversation with Kenneth Zarker and Hope Costillo of Texas Water Commission's Office of Pollution Prevention and Conservation and RENEW, June 17, 1993.
5. Phone conversations with Philippe Laroche, Canadian Chemical Exchange, May 14, 1993; Bob Laughlin, Ontario Waste Exchange, May 5, 1993 & June 1, 1993.
6. ORTECH International, "Waste Exchanges: Their Role in Enhancing Waste Diversion in Canada;" ORTECH International, "The Ontario Waste Exchange - A Preferred Option." A presentation to the Metropolitan Toronto Waste Management Conference. October 29, 1992; ORTECH International, "Identification of Opportunities for Increased Efficiency of Waste Exchange." April 27, 1993; and phone conversation with Robert Laughlin, May 1, 1993.
7. Phone conversation with Claudia Moore, June 16, 1993; "California Waste Exchange Directory of Industrial Recyclers," 1992; "California Waste Exchange Newsletter/Catalogue, 1992;" Description of the California Waste Exchange from the CWE.
8. ORTECH, "Identification of Opportunities for Increased Efficiency of Waste Exchange" p.97.
9. Phone conversations with Bob Laughlin, Ontario Exchange, May 5, 1993, Maxie May SEIWE, May 24, 1993; Susan Salterberg IWRC, May 21, 1993.
10. ORTECH, "Increased Efficiency of Waste Exchange," p.33.
11. ORTECH, "Increased Efficiency of Waste Exchange," Table 3, p. 77-80.

12. Memorandum from Bill Lawrence (IMEX) to Todd Yerkes, "1992 Annual Report - IMEX," December 30, 1992.
13. ORTECH, p.90.
14. Phone conversation with Diane Shockey, Industrial Materials Exchange, June 14, 1993.
15. Comments by Bob Loughlin, of the Ontario Exchange and ORTECH, at the National Roundtable of State Pollution Prevention Programs conference in San Diego, April 29, 1993, and subsequent phone conversation, May 1993.
16. Phone conversation with Susan Salterberg, IWRC. May 21, 1993. Cost per ton calculated by dividing IWRC Exchange Budget by quantity of exchanges made (\$221,000/10,000 tons). Including the foundry sand would yield a figure of \$7.37 per ton.
17. Phone conversation with Maxie May, Southeast Waste Exchange. May 24, 1993.
18. Phone conversation with Maxie May, Southeast Waste Exchange, May 24, 1993.
19. Materials on NIWE provided by one of the authors, Robert Kerr, a former member of NIWE's Board of Directors.
20. King County Hazardous Waste Management Program. Pamphlet "Working Together to Reduce Hazardous Waste." February, 1993 and a printed description of IMEX.
21. Because of limitations on the scope of this study, it is not possible to provide statistical information on the relative roles of the different recycling markets referred to in this chapter. The resource and survey limitations precluded gathering information from brokerage or corporate recyclers, or trying to access or develop databases to compare their relative roles. In addition, the inadequacies of the data on transactions available through the waste exchanges would make meaningful comparisons difficult to construct. Nonetheless, it is possible to sketch out some information on the market roles, based on the information provided by the waste exchanges.
22. See R. Kerr, "Computerization of Waste Exchange Operations," report to the Regulatory Reform Staff, OPPE, EPA, 1985.
23. Hodge, J.A., Implementing Recycling Within the Regulations: Reducing the Uncertainty Over Liability. 1987 National Conference on Waste Exchange, Charleston S.C. 3/3/87.
24. Schraff, C.R., and Steinberg, R.E., RCRA and Superfund, Garland Law Publishing, 1988.

25. Note that these terms are specifically defined under 40 CFR §260.10.

