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New Jersey Hazardous Waste Facilities Plan

March 1985

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Under Contract To
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Hazardous Waste Facilities Siting Commission
March, 1985

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New Jersey DEP Division of Environmental Quality
- Bureau of Enforcement Services
- Bureau of Enforcement Data Management

New Jersey DEP Division of Waste Management
- Bureau of Classification and Manifest
- Bureau of Compliance and Enforcement
- Bureau of Field Operations
- Bureau of Hazardous Waste Engineering
- Bureau of Industrial Site Evaluation
- Bureau of Registration and Permits
- Hazardous Site Mitigation Administration

New Jersey DEP Division of Water Resources
- Bureau of Groundwater Resources Management
- Bureau of Industrial Waste Management
- Office of Permit Administration

New Jersey DEP Office of Regulatory Services

New Jersey DEP Office of Science and Research

New Jersey Department of Labor
- Bureau of Demographic and Economic Analysis

New Jersey Department of Transportation
- Division of Planning and Research

Research and Development Council of New Jersey

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SUMMARY OF CHANGES TO THE DRAFT PLAN

The changes to the draft Plan as a result of public comments and further evaluations are as follows:

1. p. iii A brief analysis of the impacts of the RCRA amendments on this Plan is presented.

2. p. 5 Information on the Plan's updates is provided.

3. p. 63 New Jersey commercial facilities analysis is amended to reflect two newly-authorized facilities and one expected closure.

4. p. 70 Anticipated closure at Emergency Technical Services Corporation is noted.

5. p. 77 Compliance Summary updated to reflect current status.

6. p. 81 Table 3-5 amended to reflect accurate 1983 manifested waste receipts. All text references also reflect corrected quantities.

7. p. 94 The analysis of cleanup wastes was reevaluated against additional information. Greater consideration was given to actions under ECRA.

8. p. 103 The shift from on-site to off-site facilities now includes consideration of potential on-site surface impoundment closures.

9. p. 136, 138 Tables 4-12 and 4-13, as well as text references, now reflect reevaluated additional waste quantities.

10.	p. 164	The description of the maximum treatment selected management methods for solids and sludges with organics is amended to reflect what was actually used in that case analysis.
11.	p. 171	All references to "waste oil recovery" are changed to the more appropriate "waste oil re-refinery".
12.	Chapter 6 Tables	Waste assignments (along with residual calculations and shortfall analysis) have been amended to reflect changes in non-manifested waste quantities determined in Chapter 4.
13.	pp. 192	The language in the Needed New Facilities section represents the Commission's policies governing new commercial facilities based on the analysis in this Plan and public comments to it.

IMPACT OF THE RCRA AMENDMENT ON THE NEW JERSEY HAZARDOUS WASTE FACILITIES PLAN

On 9 November 1984, two months after this Plan was published in draft form, President Reagan signed into law a series of amendments to RCRA as part of the reauthorization bill.

The following details the major amendments and their relationship to this Plan:

1. Restrictions on Land Disposal

   The footnotes to Table 6-2 detail the consultant's anticipation of the RCRA land disposal restrictions. Under both cases, no solvents or liquids are sent to land emplacement and stabilization is used extensively. These restrictions are likely to eventually be stronger as the legislation is implemented. Due to the complexity of Section 3004(b) of the amended Act and the variety of waste types involved, it is expected that the U.S. EPA will petition for the maximum time extension. Such an extension would place the effectiveness of new land disposal regulations beyond the timeline of this Plan. The primary change in the next updated Plan will probably be greater use of incineration and stabilization.

2. Wastes and Waste-Derived Fuels as Auxiliary Fuels

   New Jersey is far ahead of the federal government on the regulation of wastes and waste-derived fuels. Chapter 4 contains an analysis of the shift of wastes to the commercial market as New Jersey implements its more stringent regulations. The maximum treatment case reflects a significant reduction in the use and practice of fuel blending.

3. Wastes Burned in Cement Kilns

All wastes sent to cement kilns in 1983 from New Jersey generators was assumed to remain in New Jersey as the market-driven and maximum treatment cases were developed.

4. Waste Minimization Requirements

The consultant's experience with New Jersey generators has indicated some actions toward waste minimization since the implementation of both RCRA and CERCLA. Additional reduction may occur, though, perhaps five to ten percent.

5. More Stringent Regulation of Surface Impoundments

This has been evaluated in Chapter 4.

6. Minimum Technology Requirements

New Jersey's requirements for landfills and surface impoundments already exceed the federal regulations. Closures of surface impoundments are evaluated in Chapter 4. New Jersey's on-site landfills report to New Jersey DEP plans to comply with the new regulations.

7. Land Treatment/Landfarms

This practice will be discouraged. However, as it is New Jersey's intention to move toward the maximum treatment case, the impact of this will be minimal. Land treatment was not considered in the maximum treatment case.

8. Lower Small Quantity Generator Limit

New Jersey's limit for small quantity generators is already at 100 kilograms per month.

9. Additional Waste Listings/Characteristics

Additional RCRA listings pursuant to Section 3001(e) of the amended Act may effect some additional increases in waste quantities. These increases are not expected to be significant. Some wastes were already evaluated in Chapter 2. Many of the wastes mentioned in the amendments are already being managed as hazardous wastes by generators out of concern for liability. Developments on this topic must be watched carefully for the next Plan update.

EXECUTIVE SUMMARY

INTRODUCTION

General Background

The Major Hazardous Waste Facilities Siting Act, NJSA 13:1E-49, et al. (referred to as the Act), was signed into law on 10 September 1981. Formerly Senate Bill 1300 (Senate Committee Substitute), the Act became the first law in New Jersey providing for the development of needed hazardous waste treatment, storage, and disposal facilities.

The Siting Act

The Act provides a mechanism to site and construct major commercial (off-site) hazardous waste treatment, storage, and disposal facilities. It employs four phases:

Planning: This involves the development of criteria for choosing sites and an analysis of the number and type of facilities needed based on both a survey of wastes produced and the life expectancy of existing facilities. The planning phase also requires research into the means of minimizing the quantity of waste generated.

Siting: This phase is comprised of finding locations that meet the siting criteria and investigating their suitability.

Licensing: The Act requires the development of a comprehensive application process to oversee the design, construction, and operation of specific facilities.

Regulating: Procedures for monitoring facilities during operation and after closure to assure compliance with state and federal regulations, as well as to protect human health and safety, the final phase in the development of new facilities.

The Siting Commission

The Act establishes a governing body - the Hazardous Waste Facilities Siting Commission - to execute the state's responsibilities under the Act. The nine members of the Commission are appointed for staggered terms of one to three years by the Governor, with the advice and consent of the Senate. The composition of the Commission is designed to provide a variety of perspectives: three members are county or municipal elected or appointed officials, three are employed by industrial firms, and three are representatives of environmental or public interest organizations.

The Mandate

The Siting Commission is responsible for planning for the proper management of all of New Jersey's hazardous waste. Specifically, its duties include:

- Review of the criteria for siting new major hazardous waste facilities proposed by New Jersey DEP and adopted 19 September 1983.

- Preparation of the Major Hazardous Waste Facilities Plan.

- Proposal and adoption of site designations for the number and type of new major hazardous waste facilities determined to be necessary in the Plan.

- Adoption of rules and regulations for exemptions.

Commission Policies

The Commission has a responsibility beyond simply determining the number and types of facilities required to properly manage New Jersey's hazardous waste; that additional responsibility is to promote a higher order of waste management in the future. This will require the Commission to examine the production of wastes as well as the treatment and disposal of wastes. After examining, for the first time, all relevant data as they relate to generation of hazardous waste, the Commission proposes that a new management hierarchy be developed. The new management hierarchy proposed by the Commission, in order of preference, includes:

1. Source reduction
2. Recycling
3. Recovery
4. Treatment and incineration
5. Secure disposal

This new management hierarchy must be implemented over time and the current regulatory framework must be adjusted to support new treatment technologies. As envisioned, future facilities should incorporate the preferred technologies with the private sector acting as owner and operator.

In projecting the need for new capacity, the Commission is seeking to assign waste to the best available technology. In the short term, this is likely to increase the cost of hazardous waste treatment and disposal. However, over time the advantage to both the environment of New Jersey and the health of its citizens will more than offset this increase.

All hazardous waste treatment technologies produce some residues. These residues have virtually no commercial value and must be sent to a disposal facility. It is the goal of the Commission to limit the use of secure disposal facilities to residues from treatment process, bulk waste from the cleanup of contaminated sites, and a small quantity of wastes, such as metal sludges, for which there is no practicable alternative. Without a facility to dispose of such wastes, the implementation of any new management program is impossible.

Finally, the Commission will continue to explore regional management options in cooperation with our neighboring states. Some of New Jersey's waste, and some waste from other states, may lend themselves to technologies which are not yet commercially proven. However, quantities of these wastes are limited and the supply and demand factors must be considered on a regional basis.

Introduction to Facilities Plan

One of the requirements of the Act is the preparation of a Hazardous Waste Facilities Plan. This document presents that Plan.

The purpose of the Plan is to define the state's need for commercial treatment, storage, and disposal facilities for the next three to five years. The Plan represents a comprehensive analysis of New Jersey's waste management practices. Waste generation patterns and expected growth of New Jersey's industrial base were examined along with the existing and anticipated capacity and capabilities of commercial facilities. The Plan compares forecasts of future manifested waste relative to the anticipated available facility capacity to determine the number and types of facilities New Jersey will need to insure proper waste management.

SOURCES OF INFORMATION

Hazardous Waste Data Base

Manifests

An important data base used in developing this Plan was New Jersey's hazardous waste manifest information. Since 1978, New Jersey has required that generators use the hazardous waste manifest, a multipart form used to track hazardous waste from the point of generation to ultimate disposal. The manifest requires information regarding: type of waste, quantity, physical form, means of shipment, and the names of the generator, the transporter, and the intended commercial facility.

New Jersey has computerized key data from each manifest since 1978. For this study, the data for 1981, 1982, and 1983 were analyzed. Those three years represent the most accurate and complete compilation of information.

The manifests provided information not only on New Jersey's generation and waste receipts at the state's present facilities, but also on the quantities of waste imported from other states to New Jersey facilities as well as that exported to other states from New Jersey's generators.

Treatment, Storage, and Disposal Facilities Annual Reports

The reports submitted annually to New Jersey DEP by treatment, storage, and disposal facilities provide information on waste managed on site by the generator industry itself.

Interim and Final Permit Application

Permit applications submitted by treatment, storage, and disposal facilities for interim (Part A) and final (Part B) status were reviewed to provide details on the capabilities and capacities of each facility. This information proved most useful in determining the types and sizes of existing waste management technologies in New Jersey.

Additional Information

The New Jersey Industrial Waste Survey

The New Jersey Industrial Waste Survey, prepared by IT Enviroscience in cooperation with the Research and Development Council of New Jersey, provided valuable information via a formal and comprehensive survey of New Jersey generators' waste generation and plans for waste reduction. It also provided an overview of the range of available technologies for source reduction and waste treatment.

New Jersey's Management Plan for Remedial Action

Often referred to as the "Cleanup Plan", this document provides descriptions of the uncontrolled (abandoned) hazardous waste sites in New Jersey. These descriptions provide a basis for estimating the amount of waste expected to require off-site treatment or disposal as a result of site cleanups.

Survey of On-Site TSDFs

To evaluate the prospects for commercialization of on-site facilities, a questionnaire was prepared and administered by the Commission and the New Jersey Chemical Industry Council.

Survey of Transporters

A survey was also made of selected hazardous waste transporters permitted to operate in New Jersey. These surveys were conducted to determine the primary routes used to transport waste in the state and the major costs involved in doing so. This information was further analyzed to evaluate the impact that the transportation element has on generators' decisions for waste management.

Air Pollution Enforcement Data System

The Air Pollution Enforcement Data System, maintained by the Bureau of Air Pollution Control, contains information on fuel-burning equipment requiring air pollution control devices. This data system provided the fundamental information for estimating the quantity of waste and waste-derived fuels burned on site in industrial boilers.

U.S. EPA Effluent Guidelines Development Documents

The U.S. EPA Effluent Guidelines Development Documents served as the source of information on expected increases in hazardous waste generation due to the implementation of pretreatment standards for industrial wastewaters.

Adjustments of the Information

The manifest data base contained a number of transactions which caused artificial increases in the quantity of waste manifested. These included: waste routed through transfer/storage facilities, intracompany shipments, manifesting of blended fuels, etc.

Adjustments were made to these quantities based on discussions with generators, facility managers, and New Jersey DEP personnel of various divisions. These adjustments resulted in quantities which more accurately reflected the real amount of waste requiring treatment or disposal at off-site facilities.

PRESENT QUANTITIES OF MANIFESTED WASTE

Quantities Currently Manifested

The manifest data base records 565,000 tons of waste managed off site in 1981, 451,000 tons in 1982, and 500,000 tons in 1983. After adjustments, the real quantities for each of the three years equaled 412,000, 344,000, and 403,000 tons, respectively. Aqueous liquids comprise 46 to 50 percent of these quantities, solvents 7 to 9 percent, oils 15 to 19 percent, other hazardous liquid wastes 4 to 7 percent, and sludges and solid hazardous wastes 18 to 20 percent.

Major Generating Industries

The single largest industry manifesting waste off site is the chemical industry (SIC 28). This industry alone accounted for over 34 percent of the waste sent off-site in all three years. The major generating industrial groups within SIC 28 are Pharmaceuticals (SIC 2869), Miscellaneous Industrial Inorganic Chemicals (SIC 2819), and Miscellaneous Chemical Preparations

(SIC 2899). The petroleum industry (SIC 29) and primary metals (SIC 33) are the next largest groups. Petroleum industry generation averaged nearly twelve percent of New Jersey's total for the three years; primary metals generation averaged over five percent of the state's total.

Imports and Exports

New Jersey generators and facilities are greatly involved in an interstate waste management network. In 1983, New Jersey generators manifested 225,000 tons to other states. Most of this waste went to New York, Ohio, and Pennsylvania, primarily for disposal in landfills or combustion as an auxiliary fuel in cement kilns.

Of the over 400,000 tons of waste received at commercial facilities in New Jersey in 1983, 41 percent came from states outside New Jersey. Most of the waste imported from other states was sent to duPont's Chambers Works plant and SCA's Newark plant for aqueous treatment. The incineration facility operated by Rollins Environmental Services also receives significant quantities of out-of-state waste.

Transportation

An analysis was made of the primary routes used to transport manifested waste throughout the State of New Jersey. It was found that most of the waste entered New Jersey from other states at the southwest border entry points, and most of the exports passed through to other states via the same border points.

Existing Treatment, Storage, and Disposal Facilities in New Jersey

Hazardous wastes may be treated, stored, or disposed of on-site by the generator, or be shipped off-site to a commercial facility. Because the data on these facilities vary, treatment, storage, and disposal facilities are separated into commercial off-site and non-commercial on-site plants.

The capacity by type of treatment provided by the 28 operational commercial facilities is summarized below:

	Estimated Throughput Capacity in Tons Per Year
Aqueous Treatment	409,000
Incineration	35,000
Oil Recovery/Fuel Blending	392,000
Solvent Recovery	183,000
Transfer/Storage	54,000
TOTAL	1,073,000

The preparation of the Plan considered the current capabilities of each facility and any plans for expansion. The compliance history of each was also examined to determine the possibilities of a facility's closing due to serious violations or inability to meet the requirements of the Part B permit.

Commercial Facilities

In 1982, 34 commercial facilities were authorized by the New Jersey DEP to handle hazardous waste. Three of these facilities no longer accept hazardous waste, three have not yet begun full operation, one is temporarily out of operation, and one facility is limited to a single off-site waste stream. In 1984, two additional facilities received permits to operate and one specialized facility of the 34 is expected to close.

Non-Commercial Facilities

Annual reports for 1983 of 242 non-commercial facilities were analyzed to determine waste flows and types. These facilities were estimated to produce and handle 11,767,000 tons in 1983. Three firms represent 89.8 percent of the total, almost all of which is wastewater with characteristic corrosivity, being strong acids or alkalies with minor contaminants. If the wastewater from these facilities is excluded from the total, then 1,204,000 tons of hazardous wastes are estimated for on-site waste generation and management in 1983.

ADDITIONAL SOURCES OF FUTURE MANIFESTED WASTE

Not all the waste likely to exert demand for commercial facilities is adequately represented in the current manifest data base, nor is most of it even included in non-commercial

TSDF annual reports. The information contained in this Plan represents a first-time effort to quantify these "additional sources" of future manifested waste.

Additional sources include wastes from the cleanup of uncontrolled sites and wastes generated from both the pretreatment of industrial wastewaters and from stricter regulations on the burning of wastes and waste-derived fuels in boilers.

Cleanup Wastes

Information on 160 sites requiring cleanup under the provisions of CERCLA was examined to estimate the amount of waste at each site and the amount of waste likely to be sent off site for treatment or disposal. Although a variety of considerations influence the decision of whether to remove waste from a site or leave it in place, some generalizations were possible. Aqueous waste -- from lagoons and impoundments -- will likely be treated on site. Contaminated soil, because of the costs involved in removal, will also likely be treated or contained on site. Bulk oils, drums, and tank cleaning/decontaminating solutions will probably be shipped off site for treatment. Wastes from ECRA cleanups were also evaluated, though, the data are too preliminary for use in projecting future quantities.

These generalizations suggest that 78,000 tons of waste may reasonably be expected to be manifested off site each year during the time frame of the Plan. Sludges and contaminated soils should account for most of this waste. Because the specific details of Remedial Action Master Plans (RAMPS) and Remedial Investigation/Feasibility Studies (RI/FSs) are not yet available for most of the sites in the Cleanup Plan and experience with ECRA is not extensive, estimates of waste quantities should be considered an order of magnitude projection.

Shift from On-Site to Off-Site Facilities

Closure of on-site facilities could easily shift a considerable amount of previously unmanifested waste to the commercial market. One good example of this type of shift was seen in the 1983 data when duPont closed its Gibbstown wastewater treatment plant and shipped 42,000 tons of aqueous organic waste to duPont's commercial facility at Chambers Works. This shift alone increased the 1983 manifested quantities by nine percent over the 1982 quantities.

This example notwithstanding, a review of the on-site treatment and disposal facilities with the staff of the Bureau of Hazardous Waste Engineering and the Bureau of Groundwater Resources Management indicated that on-site treatment and disposal facility closures will be completed by 1988 and result in a shift of about 2,000 tons of continuously-generated aqueous wastes to commercial facilities.

Waste Burned in Boilers

An intensive analysis of the records on fuel-burning equipment was conducted to estimate the amount of waste likely to require commercial treatment upon promulgation of stricter regulations limiting the burning of waste and waste-derived fuels in industrial boilers. From the Air Pollution Enforcement Data System, it was estimated that approximately 40,000 tons of waste per year are burned in boilers having rated gross heat inputs of between 0.5 million and 187 million BTU per hour. Stricter regulations could shift 9,000 tons per year from on-site burning in boilers to off-site facilities.

Impact of Effluent Regulations

Regulations setting pretreatment standards for new and existing sources under the Federal Water Pollution Control Act are also likely to increase the amounts of waste manifested to commercial facilities. The U.S. EPA Effluent Guidelines Development Documents estimate both water quality and non-water quality impacts from the implementation of pretreatment standards served as the basic source documents. EPA's nationwide estimates by industry were applied to New Jersey using common indicator statistics of size (e.g., number of plants or number of employees by industry) to yield preliminary estimates.

The Pretreatment Section personnel in New Jersey's Division of Water Resources reviewed these estimates. Based on their comments, the quantity of waste expected to be generated from the implementation of pretreatment regulations was finalized at 32,000 tons annually.

Impact of Regulatory Shifts in Other States

Discussions were conducted with the regulatory personnel of the eastern United States regarding two major issues: RCRA program changes and changes in availability of commercial facilities.

It was determined that landfill capacity had decreasd markedly. It will probably be further restricted due to stricter regulation of some waste types. Applications for new land emplacement facilities are not progressing as quickly as those for treatment and incineration facilities.

ANALYSIS OF DATA

Demand for Off-Site Facilities

Normalized manifested waste quantities for 1981, 1982, and 1983 were projected to 1988 based on expected economic recovery and growth, waste listings and delistings, and potential for at-source reduction. These projected quantities, including those currently being exported, represent New Jersey's "demand" for facilities. The economic indicator used for projections was industry shipments in constant (1972) dollars. Estimates of at-source reduction were developed, using the responses given by generators to the Research and Development Council's Industrial Waste Management Survey, and provided a basis for estimating waste reduction.

Quantities estimated from the 1981, 1982, and 1983 manifest data were weighted 1:1:2 to give more weight to the 1983 data which contained fewer variations due to errors. The weighted quantities equaled 431,000 tons. The addition of the 121,000 tons projected for other sources of manifested waste (e.g., waste from site cleanups) resulted in a total projection of 552,000 tons for 1988.

Three Cases for Determining Facility Needs

Facility needs were analyzed under three alternative cases:

- Market-Driven - Wastes were assigned to technologies based largely on how they would be managed in the free market system.

- Maximum Treatment - Wastes were assigned to treatment technologies consistent with the Commission's proposed waste management hierarchy:

  a. Materials recovery
  b. Energy recovery
  c. Hazardous constituent destruction
  d. Reduction of volume or hazard
  e. Isolation from environment

- Maximum Use of Non-Commercial Capacity - Underutilized capacity of on-site, company-owned facilities was considered additional capacity to which wastes might be assigned in the same manner as in the market-driven case.

These cases allow evaluation of facility needs in the face of varied and changing available policy options. The market-driven case examines facility choices in the short-term: those whose implementation requires little change in current waste management practices among generators.

The maximum treatment case is one toward which New Jersey can strive over time. It requires not only regulatory initiatives but changes in the fundamental thinking presently guiding generators in their choice of facilities.

The maximum use of commercial capacity case is a variation of the market-driven case. A survey was conducted of on-site facilities to determine their interests in commercialization. Little interest was expressed. Further analysis was given to suggest that even if interest were expressed in commercialization, the collective existing capacity was actually quite small.

For each case, the "demand" for facilities, as represented by the projected total for 1988 of 552,000 tons, was compared with the "supply of facilities", as represented by the capacity of existing commercial facilities in New Jersey. Waste imports to New Jersey in 1983 quantities were considered for 1988 by reducing the "supply" of facilities to accommodate them. The comparison indicated the following shortfalls:

Facility Type	Shortfall Market-Driven Case (tons)	Shortfall Maximum Treatment Case (tons)
Immediate Needs		
Incineration	25,000	109,000
Stabilized Land Emplacement	52,000	70,000
Unstabilized Land Emplacement	67,000	39,000

Facility Type	Shortfall Market-Driven Case (tons)	Shortfall Maximum Treatment Case (tons)
Future Needs		
Oil Recovery	--	47,000
Pyrometallurgical Metals Recovery	3,000	4,000
Ion Exchange Metals Recovery	--	3,000
Advance Thermal Destruction	--	19,000
Land Treatment	20,000	--

CONCLUSIONS

The needed facilities were determined based on two criteria after the analysis of the three cases was complete: (1) a shortfall exists in both the market-driven and the maximum treatment cases, and (2) the size of the shortfall suggests that the private sector would develop the facility without public subsidy. The application of these two criteria and other considerations revealed a clear need for two types of facilities: one or more rotary kiln incinerators to satisfy a capacity shortfall of between 50,000 to as much as 75,000 tons per year, and land emplacement facility of eighty acres (twenty-year life).

The facilities specified in the Plan are needed now and will still be required when New Jersey moves to full implementation of the maximum treatment case.

The specified facilities can handle a broad range of wastes. As New Jersey moves fully to the maximum treatment case, technologies specific to certain wastes will be developed and will take a portion of the markets of existing facilities. Still, the wastes projected for the more specialized facilities in the maximum treatment case can, for the most part, be managed by New Jersey's existing facilities and the new incineration and land emplacement facilities specified by this Plan.

FUTURE AGENDA

New Regulations

New regulations governing land emplacement facilities, waste in boilers, and wastewater pretreatment are only a few of the additional items which must be addressed by the Commission. For that reason, this Plan is scheduled for periodic update. Updates will be necessary not only to accommodate new regulations but also changing market conditions, New Jersey administrative policies, and state-of-the-art technology.

Need for Regional Planning

This Plan clearly shows that waste management disregards state boundaries. For that reason, the creation of a consortium of states' siting authorities in the mid-Atlantic area has been formed to coordinate waste management efforts on a regional basis. To date, a regional system of waste classification has been proposed and an analysis of regional capacity needs is being explored.

Adjustments in the Siting Act

As facility needs are analyzed and new facilities are sited, adjustments to the Siting Act are likely to be necessary. The purpose of any and all adjustments will be to improve hazardous waste management in New Jersey so its population and natural environment are protected.

CHAPTER ONE

INTRODUCTION

In the environmentally conscious decade of the 1980s, New Jersey faces two difficult hazardous waste challenges; namely, how to clean up abandoned disposal sites and how to prevent future hazardous waste crises. The extent to which these challenges are met will in large part depend upon whether or not New Jersey has adequate modern facilities to properly manage its hazardous wastes.

Hazardous waste management presents the state with a growing dilemma: how to reconcile the demand for safe treatment, storage, and disposal options that protect human health and the environment with the growing (and vocal) reluctance of the public to accept the needed new facilities once they are proposed.

The Major Hazardous Waste Facilities Siting Act

In 1981, the New Jersey Legislature attempted to come to grips with this dilemma when it recognized that:

- proper treatment, storage, or disposal of hazardous waste is the exception rather than the rule;

- improper management of hazardous substances results in substantial impairment of public health and the environment;

- providing for the siting, design, construction, operation, and use of environmentally-acceptable facilities is a public purpose in the best interest of all of New Jersey's citizens; and

- the informed participation of the public and of elected officials is essential for the establishment of a mechanism for the rational siting of new facilities.

This recognition culminated in the 1981 enactment of the Major Hazardous Waste Facilities Siting Act (P.L. 1981, Chapter 279; generally known as S-1300 and hereafter as the Act). The Act develops a rational method for planning, licensing, and siting new hazardous waste management facilities in appropriate areas of the state.

The Commission

The Act establishes the Hazardous Waste Facilities Siting Commission (hereafter, the Commission), a nine-member group appointed by the Governor, with the advice and consent of the Senate. The Commission is composed of three industry representatives, three county and municipal government representatives, and three environmental or public interest group representatives.

The Advisory Council

The Act also establishes the Hazardous Waste Advisory Council, a thirteen-member group, which is also appointed by the Governor with the advice and consent of the Senate. The membership reflects a broad-based representation of interests, including representatives of community organizations, fire fighters, elected officials, and hazardous waste generators, transporters, and facility operators.

The Task Force

The Commission has formed an additional advisory group, the Hazardous Waste Source Reduction and Recycling Task Force (hereafter, the Task Force). The Task Force will advise the Commission on various policies to encourage the reduction and recycling of New Jersey's hazardous waste streams. Members of the Task Force represent environmental organizations, academia, and industry.

The Work of the Commission

As the central focus of the Act, the Commission is empowered to define the state's hazardous waste facility needs. Once defined, the group is charged with the task of assessing appropriate sites for new facilities. The designation of sites for the specific facilities needed to manage waste streams generated in New Jersey is guided by the state's siting criteria.

The Siting Criteria

The purpose of the criteria is to prevent any significant threat to human health or the environment that might result from the operation of a new hazardous waste management facility. The Act requires the criteria to:

- protect the residents of the state;
- insure structural stability of the new major hazardous waste facilities;
- protect surface water;
- protect ground water;
- provide for the safe transportation of hazardous waste to new major commercial hazardous waste facilities;
- protect environmentally-sensitive areas; and
- protect air quality.

The criteria were developed by the Hazardous Waste Advisory Council and adopted by the New Jersey Department of Environmental Protection (DEP). The adopted criteria (NJAC 7:26-13) incorporate the requirements of the Act as well as further discussion on how risk to population will be determined. Section 7:26-13(b) requires New Jersey DEP and the Commission to:

"take into consideration, at every step of the siting process, the following factors:

1. the density of population in proximity to the facility;
2. the size and type of the facility;
3. the type of waste expected to be present at the facility;
4. the transportation means and routes available to evacuate the population at risk in a maximum credible accident, including both spills and fires;

5. the size and types of other hazardous waste facilities and facilities that handle hazardous materials in the adjacent area; and

6. the availability of fire, police, and other emergency management personnel and medical facilities in the area."

The Plan

In conjunction with the criteria, the Hazardous Waste Facilities Plan (hereafter, the Plan) provides the backbone for future siting decisions to be made by the Commission. This document presents the draft of the Commission's Plan, as required by Section 10 of the Major Hazardous Waste Facilities Siting Act.

The contents of the Plan are specified in the Act. Included are:

1. an inventory and appraisal, including the identity, location, and life expectancy of all hazardous waste facilities within the state and the identity of every person engaging in hazardous waste collection, treatment, storage, or disposal within the state;

2. a current inventory of the sources, composition, and quantity of hazardous waste generated within the state;

3. projections of the amounts and composition of hazardous waste to be generated within the state in each of the next three years;

4. a determination of the number and type of new major hazardous waste facilities needed to treat, store, or dispose of hazardous waste in this state;

5. an analysis of the ability of all existing facilities to meet current and proposed state and federal environmental, health and safety standards, and their performance in meeting these standards;

6. an analysis of transportation routes and transportation costs from hazardous waste generators to existing or available suitable sites for major hazardous waste facilities;

7. procedures to encourage co-disposal of solid and hazardous waste, source reduction, materials recovery, energy recovery, waste exchanging and recycling, and to discourage all inappropriate disposal techniques, and to minimize the amount of hazardous waste to be treated, stored, or disposed of in this state; and

8. a regional analysis of existing and necessary major hazardous waste facilities and recommended procedures for coordinating major hazardous waste facilities planning on a regional basis.

Revisions to the Plan

The contents of this document incorporate suggestions made during the public comment period (September to November 1984). At that time, five public hearings were held throughout the state and over forty written comments were received. In addition, a response document is available from the Commission Office.

The importance of continuous monitoring of New Jersey's hazardous waste management system was recognized when the Siting Act was passed. Section 10 of the Act requires the Plan to be "revised and updated every three (3) years, or more frequently when, in the discretion of the Commission, changes in existing hazardous waste facilities, the amount of type of hazardous waste generated in this state, or technological advances so require".

CHAPTER TWO

FIVE YEAR PROJECTIONS FOR MANIFESTED HAZARDOUS WASTE

OBJECTIVE

Chapter Two of the Facilities Plan - Five-Year Projections for Manifested Hazardous Waste - uses manifested waste data for 1981, 1982, and 1983, the Hazardous Waste Facilities Siting Commission's "Interim Report - An Analysis of the New Jersey Manifest Information" issued in January 1984, and other documented data to forecast future waste quantities. The major activities of this chapter include:

a. Reaggregation of the Data Base for Facility Needs Analysis. Generators are reorganized by SIC codes to allow evaluation and projection of waste generating practices by industry. Waste quantities by EPA/DEP codes are assigned to treatability categories indicating suitability to commercially-available waste treatment technologies.

b. Normalization of Data Base. The totals reported for all manifested waste are adjusted to exclude the following quantities: (1) those double-counted because of generators' use of transfer/storage stations, (2) those managed at non-commercial, company-owned facilities but tracked with a New Jersey manifest, (3) blended fuels sent from solvent and oil recoverers to be burned as auxiliary fuels in cement kilns, etc., under a hazardous waste manifest, (4) wastes brokered from treatment facilities, and (5) waste generated from one-time events, such as major accidents.

c. Calculation of Projected Hazardous Waste Quantities. Using factors reflecting industrial activity (economic recovery and growth in real terms), waste listings and delistings, waste reduction possibilities, and anticipated regulatory changes by industry, quantities are projected through the year 1988.

This projection of manifested hazardous waste quantities[1] presents a significant portion of New Jersey's future demand for commercial hazardous waste treatment, storage, and disposal facilities. It will be used in combination with information supplied by Chapters Three, Four, and Five to estimate New Jersey's future facility needs in Chapter Six.

DATA BASE REORGANIZATION FOR FACILITY NEEDS ANALYSIS

The Data Base

An important data base for the development of the Plan is New Jersey's hazardous waste manifest information. Since 1978, New Jersey has required that generators use the hazardous waste manifest, a multipart form used to track hazardous waste from the point of generation to ultimate disposal. All hazardous waste moved over public roads must be accompanied by a manifest containing information regarding: type of waste, quantity, physical form, means of shipment, and the names of the generator, the transporter, and the recipient of the waste.

Manifested quantities reflect the amount of hazardous waste that generators sent off site for treatment, storage, or disposal and indicate New Jersey generators' current demand for commercial facilities. These figures do not include waste generated and managed on site at non-commercial, company-owned facilities. The New Jersey DEP computer systems convert manifested quantities to the common unit of tons by means of the following multipliers[2]:

Gallons:	8.34/2000
Cubic Yards:	1684.8/2000
Liters:	2.203/2000
Kilograms:	2.204/2000
Pounds:	1/2000

New Jersey has computerized much of the data it has acquired from each manifest since 1978. For this study, the data for 1981, 1982, and 1983 were analyzed. Those three years represent the most accurate and complete compilation of information on hazardous waste production and management in

1 All quantities through this Facilities Plan are given in terms of short tons: 1 ton equals 2,000 pounds.

2 The multipliers are based on the assumption that all volume units have the same density. The density assumed in this case is that of water.

New Jersey.[3] The accuracy of these data was assured by frequent quality control on the part of data entry personnel and by comparisons of the computerized data with generators' annual reports filed with New Jersey DEP.

Generator Reorganization by SIC Codes

As hazardous waste generation largely reflects industrial activity, hazardous waste quantities are best projected according to some measure of industrial activity. Thus, it was necessary to group generators by industry classification. The Standard Industrial Classification (SIC) coding system, developed by the U.S. Office of Management and Budget in 1957 (1972 being the most recent year of major revision), proved well-suited to the purposes of the Plan for three reasons: (1) it groups industries according to the composition and structure of the economy and covers the entire field of economic activity; (2) it facilitates comparison of statistics describing the various facets of the economy; and (3) industrial economic analyses and forecasts available from government agencies and professional forecasting firms are typically prepared in terms of, or at least consistently cross-reference, this classification system.

For each generator, a four-digit (specific industry) SIC code was determined in all cases possible. Sources for this information included George D. Hall's New Jersey Manufacturers Directory 1982 and the 1980 New Jersey State Industrial Directory published by the State Industrial Directories Corporation. The staff of New Jersey's Department of Commerce and Economic Development also assisted in determining SIC codes for generators not listed in either directory.

To present totals, generators were combined according to two-digit codes (major groups) except for the major group SIC 28 - Chemical and Allied Products - which generates a disproportionately large amount of waste. Table 2-1 details the percentage of hazardous waste manifested in each major SIC group in 1981, 1982, and 1983.[4] Table 2-2 details the major generating sectors in SIC 28 for these three years. Figure 2-1 depicts graphically the percentages of manifested hazardous waste generation by industry for the year 1982.

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3 They include not only waste manifested by New Jersey generators but also out-of-state ("imports") accepted by New Jersey commercial facilities.

4 Waste quantities before normalization (see pages 21 and 22); relative percentages change marginally after normalization.

TABLE 2-1

GENERATION OF MANIFESTED WASTE
BY MAJOR INDUSTRIAL GROUP

SIC Code	Group Name	Percent of 1981 Waste	Percent of 1982 Waste	Percent of 1983 Waste
20	Food and Kindred Products	2.1	4.4	3.5
22	Textile Mill Products	0.2	0.3	0.2
25	Furniture and Fixtures	<0.1	<0.1	<0.1
26	Paper and Allied Products	0.9	2.2	1.0
27	Printing and Publishing	0.2	0.2	0.4
28	Chemicals and Allied Products	38.6	37.6	34.1
29	Petroleum Refining[1]	12.5	10.6	12.8
30	Rubber and Miscellaneous Plastics	0.3	0.3	0.2
31	Leather and Leather Goods	0.1	<0.1	<0.1
32	Stone, Clay, Glass, and Concrete	7.5	3.7	1.0
33	Primary Metals	3.9	5.2	6.8
34	Fabricated Metals	2.7	2.0	3.2
35	Machinery, Except Electrical	2.3	2.6	1.7
36	Electrical and Electronic Machinery	1.4	1.2	0.7
37	Transportation Equipment	1.7	1.3	1.0
38	Measuring, Analyzing, Controlling Instruments	0.4	0.3	0.6
42	Transportation Services	1.5	0.6	0.3
49	Electric, Gas, Sanitary Services	1.9	1.5	3.5
7399	Miscellaneous Business Services[2]	5.7	6.6	7.1
7699	Miscellaneous Repair and Industrial Services[3]	13.7	14.9	15.9
90-97	Government and Military	1.9	1.0	0.7
Misc.[4]		1.5	3.5	4.0
	TOTAL	100	100	100

1 About 88 percent from 2911-Petroleum Refining; 12 percent from 2992-Blending and Rerefining (including oil recovery facilities).

2 Includes solvent recovery operations.

3 Includes the majority of industrial contractors, environmental service contractors, and commercial tank cleaning firms. These groups typically manifest the hazardous waste produced from their activities on behalf of their customers under their own name. This group also includes commercial facilities not classed as solvent recovery or oil recovery, except Rollins.

4 Includes Rollins Environmental Services, Inc. for waste it sent as a generator.

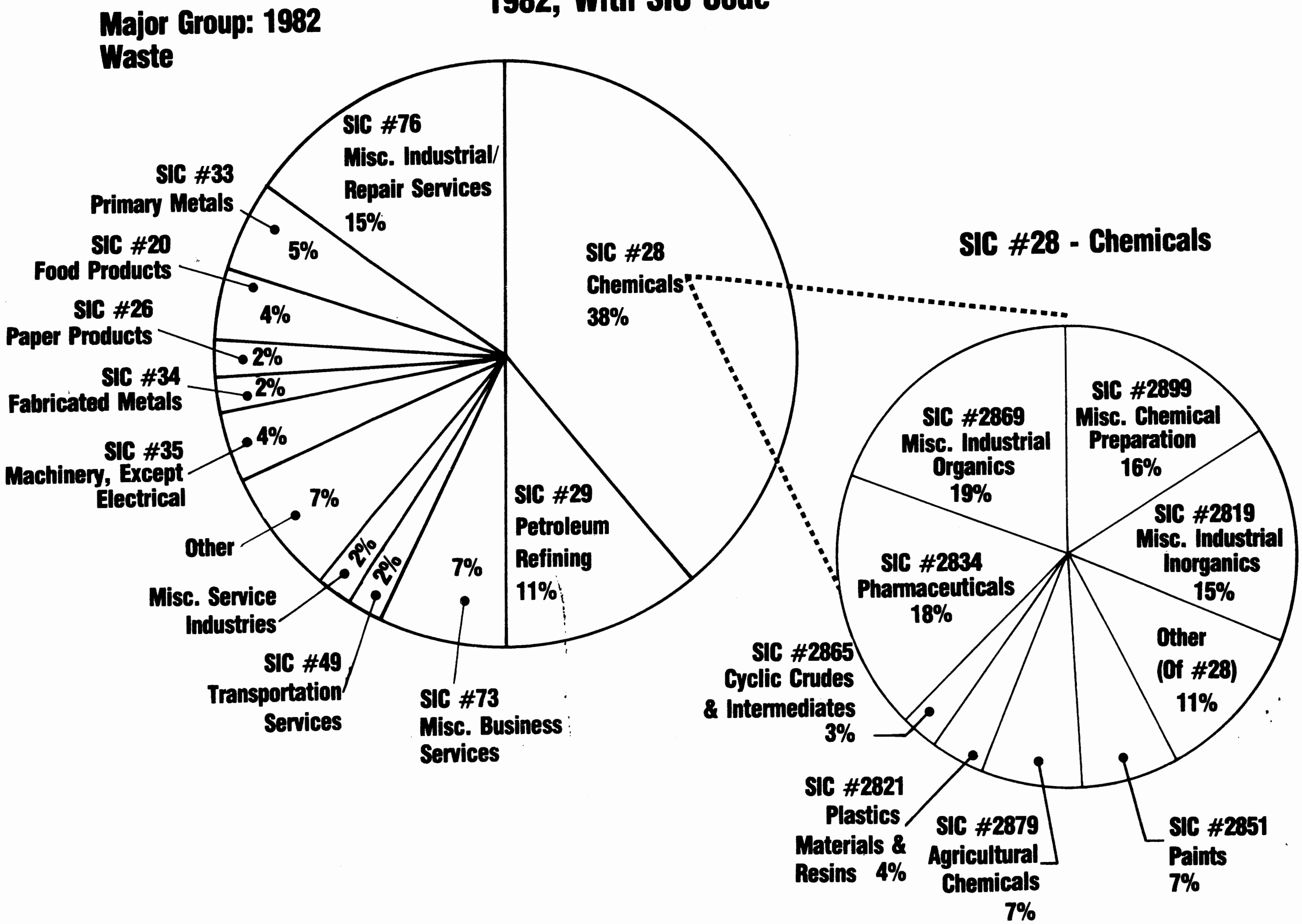
TABLE 2-2

GENERATION OF MANIFESTED WASTE
BY INDUSTRIES WITHIN SIC 28

SIC		Percent of SIC 28			Percent of All NJ Waste		
		81	82	83	81	82	83
2819	Industrial Inorganic Chemicals, NOS[1]	22.2	15.0	32.3	8.7	5.8	11.1
2821	Plastic Materials and Resins	3.6	4.0	3.4	1.4	1.5	1.1
2834	Pharmaceutical Preparations	14.5	18.1	16.9	5.6	6.8	5.8
2851	Paints and Allied Products	5.4	7.2	7.6	2.1	2.7	2.6
2865	Cyclic Crudes and Intermediates	3.6	2.9	2.8	1.4	1.1	1.0
2869	Industrial Organic Chemicals, NOS	22.5	18.9	13.8	8.7	7.1	4.5
2879	Agricultural Chemicals, NOS	5.4	7.4	8.4	2.1	2.8	2.9
2899	Chemical Preparations, NOS	16.3	16.0	6.5	6.3	6.0	2.2
Other 28		6.2	10.1	8.3	2.3	3.8	2.9
		100	100	100	38.6	37.6	34.1

1 NOS: Not otherwise specified

Figure 2-1
Generation of Manifested Waste
By Industrial Group
1982, With SIC Code



Quantity Reaggregation by Treatability Categories

Generators, when completing manifests, identify the type of waste using the EPA/New Jersey hazardous waste coding system (see Appendix A). This system identifies the hazardous properties or constituents of the waste, but it does not describe its treatability or its potential for recycling. For purposes of the Facilities Plan, it was necessary to reaggregate these waste quantities in terms of their treatability, i.e., to group together those waste types having similar physical and chemical characteristics and general treatment requirements. Examination of wastes in terms of their treatability provides a very suitable scheme for modeling the dynamic situation of hazardous waste management.

Treatability categories were assigned to wastes identified on a computer listing, provided by the New Jersey DEP, of all New Jersey generators' manifest transactions[5] in 1981, 1982, and 1983. The assignment of treatability categories required a significant investment of time to examine simultaneously the EPA/New Jersey waste code, the generator's SIC code and the industrial processes typical of that code, the original units of measure for each waste load shipped, the physical form (liquid, solid, sludge, or gas), the nature and range of waste handling methods available at the generator-selected commercial facility, and the initial method of handling actually employed by the commercial facility for each waste shipment received. This information had to be examined compositely to assign waste to treatability categories.

Example of Assignment to Categories

The method of assigning a manifested waste to a treatability category is best illustrated by an example. One example is F005 (non-halogenated solvents and still bottoms) sent from one generator in SIC 2893 (Printing Ink) to a solvent recovery facility, a cement kiln and a fuel blending facility. For shipments to the solvent recovery facility, treatability category non-halogenated solvents was assigned, its non-halogenated nature being determined from the EPA code (F005). For the shipments sent to the cement kiln or fuel blending facility in 1981 or 1982, the hybrid treatability category combustible liquid/sludge was given, indicating that the waste

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5 A waste transaction is defined as the total quantity of a single waste type between one generator and one or more commercial treatment, storage, or disposal facility.

was merely a combustible substance.[6] For 1983 data, additional information was available on the physical state and combustible wastes were classified under either combustible liquid or combustible sludge. In the absence of additional information in 1981 and 1982, the waste remained in the combustible liquid/sludge category. To complete the task report summary totals, however, this category was prorated among the combustible liquid and combustible solid/sludges based on the ratio of liquid to solids/sludges observed for 1983 data.

Direct Examination of Transactions

For 1981 and 1982 data, all waste types manifested by individual generators in quantities of 100 tons or more were examined specifically and assigned to a treatability category. By this method, at least eighty percent of total 1981 and 1982 wastes received direct examination. Furthermore, this method examined an average of ninety percent of the total quantity of each significant waste type: those generated in very large amounts in New Jersey (e.g., X900, X726, and D001, each equaling 7.0 percent or more of the state's total waste quantity in all three years) and those having special treatability requirements (e.g., arsenic, cyanide, and certain organic wastes).

The examination of 1983 data was somewhat different because the data were available later and were requested in a different format. Again, all generator manifest transactions of 100 tons or more in 1983 were examined directly. However, to provide more representative examination, at least 100 additional transactions were examined from each of the following tonnage ranges: 51 to 99, 11 to 50, and 1 to 10.

For any year, the unexamined portion of a waste type was prorated among the treatability categories determined for the examined portion of the same waste type. To prorate, a multiplier was calculated for each waste type by dividing the manifested quantity (reported in the Commission's Interim Report) by the examined quantity. This method of examination, including proration, resulted in a calculation error of less than two percent from the total quantity reported in the Interim Report. The calculation error is primarily attributed to the fact that the multiplier was calculated to only two decimal places.

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6 While the waste is likely a liquid, the code F005 applies to still bottoms as well.

Unexamined Waste Types

The examination cutoff of 100 tons or more in 1981 and 1982 resulted in some waste types not being examined at all. This occurred with 1983 data also, but to a much lesser extent because of the more representative method of examining waste transactions. The unexamined waste types were typically reported in very minute quantities, and cumulatively they accounted for not more than three percent of the total manifested waste in any of the three years. Because of the extensive amount of time required to analyze such disproportionately small amounts of waste and because of the difficulty of reclassifying them without more information than that available from manifests, the quantities for these wastes were summed and listed under "unexamined". Assignment of these wastes to treatability categories is not essential for the completion of a realistic facility needs analysis.

Table 2-3 details manifested hazardous waste quantities by treatability categories after in-depth evaluation. The summation of quantities by the major treatability categories is displayed in Table 2-4.

DATA BASE NORMALIZATION

During the preparation of the Interim Report, the Siting Commission identified several types of manifest transactions which, when included in the data base, caused artificial increases in the total quantities of manifested hazardous waste. It was necessary during the preparation of this Plan to understand the nature of these transactions, identify them in the data base, and eliminate their effects.

Double Counting

Transfer/Storage Facilities

"Double counting" refers to instances in which a quantity of waste is recorded twice in the data base in the same or slightly varied physical/chemical form. The most common case of double counting is that in which a transfer/storage facility manifests to treatment or disposal facilities a waste which it accepted from other generators and repackaged without affecting the waste's properties or volume. The transfer/storage facility serves as a broker in most cases, locating for the generator a treatment or disposal firm. It often accepts small quantities of wastes and brokers bulk quantities of that waste type to treatment or disposal facilities.

√TABLE 2-3

NEW JERSEY MANIFESTED WASTES
BY TREATABILITY CATEGORIES
(In Thousands of Tons)

	1981	1982	1983
AQUEOUS LIQUIDS			
Corrosive, with Metals	20	22	24
Corrosive, NOS[1]	48	50	59
Contains Cyanide	<1	<1	1
Contains Hexavalent Chrome	30	19	9
Inorganics, NOS[1]	18	1	0
Tank Cleaning Solutions	32	14	16
Organics, NOS[1]	15	16	71[2]
Aqueous Liquids, NOS[1]	75	51	24[3]
SOLVENTS AND OILS			
Non-Halogenated Solvents	13	10	10
Halogenated Solvents	7	5	10
Solvents, NOS[1]	11	13	20
Automotive Oils	32	26	42[4]
Industrial Oils	35	37	34[4]
Fuel Oils	8	8	15[4]
Oils, NOS[1]	<1	2	6
OTHER LIQUIDS			
Combustible Liquids	2	3	49[5]
Combustible Liquids/Sludges	63	57	0
Liquids with Toxic Metals	<1	2	1
Reactive Liquids	2	1	1
Corrosive Liquids	<1	<1	<1
PCB Liquids	<1	1	3
Liquid Wastes, NOS[1]	<1	<1	4
SLUDGES AND SOLIDS			
With Heavy Metals	53	30	53
With Organics	37	32	20
Paint Residues	12	2	<1
Oily Residues	17	9	7
Combustible, NOS[1]	2	2	2
Corrosive, NOS[1]	3	3	2
Reactive, NOS[1]	20	18	<1
Toxic, NOS[1]	<1	<1	1
Sludges and Solids, NOS[1]	5	7	12
UNEXAMINED	10	12	2
TOTAL	573	456	500

[1] NOS - Not otherwise specified.
[2] Includes 42,000 tons of waste generated by duPont, Gibbstown due to closure of the on-site treatment plant.
[3] 1983 number differs from 1981 and 1982 numbers due to more information allowing better assignment to categories.
[4] Increased in waste oil numbers reflect full year of waste oil regulations in force.
[5] Information on physical form eliminated need for liquids/sludges category. Most waste therein was waste liquid.

TABLE 2-4

NEW JERSEY MANIFESTED WASTE
BY MAJOR TREATABILITY GROUPS
(In Thousands of Tons)

	1981	1982	1983
Aqueous Liquids	238	173	204
Solvents	31	28	40
Oils	75	73	96
Other Liquids	69	65	59
Organic Sludges and Solids	71	49	34
Inorganic Sludges and Solids	79	56	65
Unexamined	10	12	2
TOTAL	573	456	500

Transfer/storage facilities provide a useful waste management service to generators, especially small quantity generators. However, the total demand for an ultimate treatment or disposal facility is not affected by whether the transfer/ storage facility continues its service. The waste that transfer/storage facilities manifest to other commercial facilities was already manifested once when the original generator sent the waste to the transfer/storage facility.

All waste sent from transfer/storage facilities had to be discounted. Hazardous wastes which transfer/storage facilities may have generated from their own operations, in addition to that accepted from generators, was found to be minimal. Elimination of waste quantities counted in the data base twice due to transfer/storage facility intervention reduced the manifested waste total by 44,400 tons in 1981, 34,300 tons in 1982, and 49,000 tons in 1983.

Brokering by Solvent and Oil Recovery Facilities

Another variation of double counting occurs when solvent recovery and oil recovery facilities accept, as a service to their customers, waste types which they themselves have not the capability to treat but which they broker for the original generator to an appropriate commercial facility. For those waste types, the solvent recoverer or oil recoverer serves only as a transfer facility. Neither the composition nor the volume of the waste type is altered. Based on discussions with facility operators, manifest transactions in which solvent or oil recoverers acted as transfer facilities amounted to about 2,700 tons in 1981, 2,200 tons in 1982, and 2,000 tons in 1983.

Manifesting of Blended Fuels

Solvent and oil recoverers' practice of blending spent solvents and oils for fuel can lead to double counting if the blended fuels are sent to cement kilns or other energy recovery units accompanied by manifests. While recovered solvents or oils resold as product need not be manifested, the regulations do not specify clear manifesting requirements for solvents and oils blended for auxiliary fuel. Some blended fuels from solvent and oil recoverers are being manifested. However, this practice is not consistent over all solvent and oil recoverers. These manifested quantities do not represent new demand to the commercial facility market, but rather wastes leaving the commercial market. Elimination of the wastes sent for use as fuel but tracked with hazardous waste manifests accounted for 27,300 tons in 1981, 21,500 tons in 1982, and 30,200 tons in 1983.

Pending fuel standards by New Jersey DEP may result in more consistent manifesting of blended fuels. Though this may increase overall quantities of manifested waste, the increase would still be artificial. Blended fuels used for energy recovery would still represent double-counted waste.

Summary

Total waste, then, eliminated from the data base due to double counting equals 74,400 tons in 1981, 58,000 tons in 1982, and 81,200 tons in 1983 as follows:

	1981	1982	1983
Transfer/Storage Facilities	44,400	34,300	49,000
Brokering of Spent Solvents and Waste Oils	2,700	2,200	2,000
Manifesting of Blended Fuels	27,300	21,500	30,200
	74,400	58,000	81,200

Intracompany Waste Shipments to Captive Facilities

The data base includes many cases of a company or plant listed on the same manifest as both the generator and the commercial facility. It was determined, with the cooperation of the New Jersey DEP's Bureau of Manifest and Classification, that these were almost all movements of waste to company-owned, non-commercial facilities, many times when a manifest was not even required.

Waste tracked to company-owned, non-commercial facilities does not represent existing demand for commercial facilities and therefore should be excluded from the quantity used in the facility needs analysis.[7] Wastes discounted due to management at company-owned facilities amounted to 55,400 tons in 1981, 31,600 tons in 1982, and 5,000 tons in 1983. The great

7 An analysis of the possible shift from use of on-site facilities to commercial facilities will be examined in Chapter Four.

decrease in the 1983 quantity is very likely attributable to generators' better understanding of the requirements governing use of manifests.

One-Time Events

Wastes generated from site cleanups and other one-time or infrequent events are not necessarily governed by the same determinants as are wastes from industrial activity. Thus wastes from major accidents, CERCLA remedies, and RCRA closures were discounted because they should not be included and projected along with production-generated wastes. However, because these wastes present additional real demand for commercial facilities in New Jersey, they are considered separately in more detail in Chapter Four. It should be noted that wastes resulting from plant and routine transportation spills are not eliminated. These wastes have some general relationship with industrial activity and in the aggregate, provide some measure of steady business to spill contractors.

Elimination of quantities generated from site cleanup and major accidents reduced the data base by 31,000 tons in 1981, 18,000 tons in 1982, and 500 tons in 1983.

Inclusion of Residues from Commercial Waste Treatment Operations

Residue from commercial facilities' operations are not excluded from the data base. Though these wastes do represent a small fraction of the original waste received by commercial facilities, residues require additional treatment or disposal and, therefore, still represent demand for commercial facilities. The quantity of residue remaining in the data amounts to approximately 31,600 tons in 1981, 34,400 tons in 1982, and 39,800 tons in 1983.

Inclusion of Non-Hazardous Waste

It should be noted that the normalized data base contains some manifested non-hazardous waste, or "generator declared" waste. Many industries, aware of the penalties for non-compliance under RCRA and also realizing that the commercial hazardous facilities are safer than sanitary landfills and some other industrial waste management facilities, often elect either to declare their waste hazardous or to code it on the manifest as non-hazardous and ship it to a commercial facility. Often it is difficult for generators, particularly small ones, to determine accurately whether each load or drum of waste is hazardous. If great variability exists in the waste stream, many generators will manifest as hazardous every time.

New Jersey DEP has included some codes in its "X" series of wastes primarily for non-hazardous waste (e.g., the X900 series). These codes were assigned at the request of generators wanting to send their waste to commercial facilities which would only accept that waste with a completed manifest.

In most cases, even though wastes in these cases are not, or may not be, hazardous, they need to be included in the data base. These wastes represent real demand for commercial facilities and must be included when defining facility needs. One case, though, is excluded. Hoffman LaRoche in Warren County sent most of its industrial wastewater to the Middlesex County Utility Authority (a publicly-owned treatment works) in 1982 and 1983 because its local municipal wastewater treatment plant could not handle the wastewater. Hoffman LaRoche manifested the waste under X900. The manifest served primarily as a bill of lading. The waste was not hazardous and the Middlesex County Utility Authority is not a commercial hazardous waste facility. This exclusion accounted for 4,000 tons in 1982 and 10,000 tons in 1983.

Normalized Totals of Manifested Waste

The normalized data base contains the quantities of wastes generated relative to general industrial activity and likely to be generated on an ongoing basis. It equals 412,000 tons in 1981, 344,000 tons in 1982, and 403,000 tons in 1983.

Table 2-5 shows the conversion of the total manifested hazardous waste data to the normalized data base. Table 2-6 details treatability categories for the normalized hazardous waste quantities in New Jersey. Table 2-7 combines the normalized quantities in Table 2-6 into summary treatability groups. Table 2-8 is a further summarization of treatability categories.

DEVELOPMENT OF PROJECTION FACTORS

The Major Hazardous Waste Facilities Siting Act (NJSA 13:1E-49, et al.) requires that the Hazardous Waste Facilities Plan include a projection of manifested waste quantities for a five-year period. The projection factors to be used in

TABLE 2-5

CONVERSION OF MANIFESTED DATA BASE
TO NORMALIZED DATA BASE
(In Thousands of Tons)

Total	1981	1982	1983
Manifested Hazardous Waste	573	456	500
Less			
Waste from Transfer Storage Facilities	44.4	34.3	49.0
Waste Brokered by Solvent and Oil Recovery Facilities	2.7	2.2	2.0
Waste Sent for Auxiliary Fuel Under Manifest	27.3	21.5	30.2
Waste to Captive Facilities	55.4	31.6	5.0
Waste from One-Time Events	31.0	18.0	0.5
Non-Hazardous Waste	--	4.0	10.0
Normalized Manifest Hazardous Waste	412	344	403

TABLE 2-6

NORMALIZED AND ADJUSTED MANIFESTED QUANTITIES BY TREATABILITY CATEGORIES
(In Thousands of Tons)

	1981	1982	1983
AQUEOUS LIQUIDS			
Corrosive, with Metals	20	21	21
Corrosive, NOS	45	34	58
Contains Cyanide	<1	<1	1
Contains Hexavalent Chrome	29	19	9
Inorganics, NOS	5	2	0
Tank Cleaning Solutions	31	14	16
Organics, NOS	15	13	60
Aqueous Liquids, NOS	62	51	24
SOLVENTS AND LIQUIDS			
Non-Halogenated Solvents	13	9	10
Halogenated Solvents	4	4	8
Solvents, NOS	11	13	20
Automotive Oils	24	22	37
Industrial Oils	32	36	27
Fuel Oils	4	6	11
Oils, NOS	<1	2	3
OTHER LIQUIDS			
Combustible Liquids	20	19	14
Liquids with Toxic Metals	<1	2	1
Reactive Liquids	2	<1	1
Corrosive Liquids	<1	<1	<1
PCB Liquids	<1	1	3
Liquid Waste, NOS	1	<1	3
SLUDGES AND SOLIDS			
With Heavy Metals	21	14	36
With Organics	29	30	17
Paint Residue	7	2	<1
Oily Residue	16	7	7
Combustible, NOS	1	2	2
Corrosive, NOS	3	2	2
Reactive, NOS	<1	<1	<1
Toxic, NOS	1	<1	1
Sludges and Solids, NOS	5	5	9
UNEXAMINED	10	12	2
TOTAL	412	344	403

TABLE 2-7

NORMALIZED AND ADJUSTED MANIFESTED QUANTITIES
BY SUMMARY TREATABILITY CATEGORIES
(In Thousands of Tons)

	1981	1982	1983
AQUEOUS LIQUIDS			
Inorganic	138	109	106
Organic	69	45	83
SOLVENTS			
Halogenated	13	9	10
Non-Halogenated	4	4	8
Solvents, NOS	11	13	20
OILS			
Automobile	24	22	37
Industrial	32	36	27
Fuel	4	6	11
Oils, NOS	<1	2	3
OTHER LIQUIDS			
Combustible	21	19	17
Toxic with Metals	<1	2	1
Reactive	2	1	1
Corrosive	<1	<1	<1
Toxic with Organics	<1	1	3
SLUDGES AND SOLIDS			
Heavy Metals	22	15	37
Oily	17	7	7
Paint	7	2	<1
Combustible	2	4	3
Corrosive	3	2	3
Reactive	<1	2	<1
Organics	30	31	22
Other	2	<1	2
UNEXAMINED	10	12	2
TOTAL	412	344	403

TABLE 2-8

NORMALIZED AND ADJUSTED MANIFESTED
WASTE QUANTITIES BY
MAJOR TREATABILITY GROUPS
(In Thousands of Tons)

	1981	1982	1983
Aqueous Liquid	207	154	189
Solvents	28	26	38
Oils	60	66	78
Other Liquids	23	23	22
Organic Sludges and Solids			
Inorganic Sludges and Solids			
Unexamined	10	12	2
TOTAL	412	344	403

predicting hazardous waste quantities through 1988 were developed to account for the following influences on the generation of manifested waste:

a. Economic recovery and real growth
b. Waste listing and delisting
c. Waste reduction and recycling
d. Regulatory changes

Economic Recovery and Real Growth

Of the different indicators of industrial growth, industry shipments in constant (1972) dollars is the most appropriate for projecting hazardous waste quantities. This indicator is more strongly related to production or volume of output than total employment, which includes non-production as well as production workers. Changes in non-production employment, such as clerical, sales, or managerial, would not affect waste generation. The production worker statistic, while a better measure than total employment for the purposes of the Facilities Plan, was also deemed inadequate. Increased plant automation in many industries could have little impact on waste generation while considerably reducing the number of production workers. Value added, a growth indicator which subtracts from an industry's shipments figure an amount equal to the costs of raw and intermediate materials to produce a figure equal to the given industry's own contribution to the economy, would have been the best statistic to use. However, complete and sufficient data are not available to use it for forecasting waste quantities.

The 1984 U.S. Industrial Outlook prepared by the Bureau of Industrial Economics in the U.S. Department of Commerce served as the primary source for industrial shipments projections. The growth parameter must be expressed in constant dollars because "... percent change in constant dollars is used to measure change in volume, and indicates real growth or lack of it. It affords a uniform basis for evaluating industry growth and interindustry comparisons without the distorting influence of price change".[8]

Because the figures in the Outlook were calculated for industries on a nationwide basis, it was necessary to meet with New Jersey's Bureau of Demographic and Economic Analysis to confirm the applicability of the figures to New Jersey's industries. Where necessary, the Outlook figures were

8 U.S. Department of Commerce. Bureau of Industrial Economics. 1984 U.S. Industrial Outlook, p. 2.

adjusted to reflect the particularities of the state's industrial base. Table 2-9 shows, for each industry, the observed changes in industry shipments in constant dollars from 1981-1982 and 1982-1983 as well as the forecasted changes through 1988.

The 1982-83 and forecasted 1983-84 figures reflect the Outlook assumption that the recovery which began in the first quarter of 1983 will continue through 1984. The somewhat lower compound annual rate for 1985 through 1988 reflects expected real growth.

Waste Listings and Delistings

Waste Listings

New Jersey DEP. Table 2-10 shows those wastes not in the RCRA list of 40 CFR 261 to which New Jersey has assigned a state waste code ("X" prefix). Of these, only X721 through X728 have been incorporated into the state's hazardous waste regulations and thus require manifests. The others are those which the state is currently evaluating for inclusion in the regulations. Some generators, though, are already voluntarily using manifests when shipping these other "X" wastes. In fact, quantities were manifested for 22 of these 26 "X" wastes.

It is very likely that X387 (Polychlorinated Biphenyls, N.O.S.) will be incorporated into the regulations in 1984. The data base already reports 2,844 tons manifested in 1981, 2,518 tons manifested in 1982, and 4,709 tons manifested in 1983. Because of EPA and state environmental agencies' well-publicized concerns to regulate PCBs, it is believed that the quantities reported for 1981, 1982, and 1983 reflect a large majority of X387 that generators would have manifested to commercial facilities had it been included in the regulations.

It is difficult to predict increases in manifested quantities of PCBs since they are no longer manufactured or used in transformers and capacitors. Generation is linked to the rate at which old transformers are replaced and to some degree the availability of disposal services, but it is not a function of industrial activity. Based on discussions with New Jersey DEP, it is estimated that once listed, quantities of PCBs manifested might increase immediately by five to ten percent and then be generated at a fairly constant average annual rate for at least the time frame of this Plan.

Table 2-9

Economic Projection Factors

SIC#	Industry	Δ81-82[1,2]	Δ82-83[1,2]	forecasted Δ83-84[1,2]	forecasted compounded annual rate Δ1985-1988[1,2]	Notes
20	Food and Kindred Products	+1.1%	+1.6%	+1.0%	+0.3%[E]	
22	Textile Mill Products	-7.8%	+9.0%	+0.3%	+0.3%[E]	
24	Lumber and Wood Products	-5.8%	+8.0%[E]	+5.0%[E]	+3.0%[E]	estimated composite
25	Furniture	--	+11.7%[E]	+9.5%[E]	+4.0%[E]	
26	Paper and Allied Products	-4.0%	+1.0%[E]	+1.0%[E]	+0.8%[E]	
27	Printing and Publishing	-0.6%[E]	+0.5%[E]	+1.0%[E]	+2.5%[E]	estimated composite
28	Chemicals and Allied Products Except:	-7.2%	+2.5%	+3.0%[E]	+3.2%[E]	
	281 Industrial Inorganic Chemicals	-6.3%[E]	0.0%[E]	+4.6%[E]	+3.4%[E]	
	282 Plastic Materials et al.	-5.4%	+10.0%	+6.9%	+3.9%[E]	
	283 Drugs	+1.7%[E]	+ 3.7%[E]	+3.6%[E]	+3.0%[E]	
	284 Soaps, Detergents, Perfumes, etc.	+1.9%	+ 1.8%	+2.2%	+2.2%	
	285 Paints, Varnishes, et al.	-7.5%	+6.8%	+5.4%	+2.0%	
	286 Industrial Organic Chemicals	-8.0%[E]	+3.7%[E]	+4.7%[E]	+3.7%	
	287 Agricultural Chemicals.	-11.5%	-10.0%	+12.0%	+5.2%	
	2899 Misc. Chemical Preparations	-11.5%	+5.0%	+3.9%	+2.0%	
29	Petroleum Refining and Related Industries	-3.1%	-2.6%	+1.0%[E]	1.0%[E]	
30	Rubber/Misc. Plastic Prods.	-4.4%	+4.1%	+5.1%	+3.0%[E]	
31	Leather Goods	-11.7%	-1.0%	-1.4%	-2.0%	
32	Stone, Clay, Glass, Concrete	-8.2%	-2.0%[E]	+0.5%[E]	+0.5%[E]	
33	Primary Metal Industries	-23%[E]	+10%[E]	+4.0%[E]	+1.7%[E]	estimated composite
34	Fabricated Metal Products	-15.6%	-6.2%	-2.0%	+1.0%[E]	
35	Machinery, not Electrical		-8.2%[E]	+2.0%[E]	+1.0%[E]	
36	Electrical and Electronic	- 2.0%[E]	+4.0%[E]	+4.5%[E]	+4.0%[E]	estimated composite
3711	Motor Vehicles	-9.5%	-1.0%[E]	+3.0%[E]	+1.3%	unit output
38	Instruments for Measurement, Analysis and Control	-5.0%	-4.0%	+1.0%[E]	+3.0%	
39	Misc Manufacturing	--	+3.0%[E]	+3.0%	+3.7%	rate of general economy

Table 2-9 (Continued)

SIC#	Industry	Δ81-82	Δ82-83	forecasted Δ83-84	forecasted compounded annual rate Δ 1985-1988	Notes
42	Motor Freight	-9.6%	+3.0%[E]	+5.0%	+3.7%	
48	Communications	+5.8%	+5.6%	+5.0%	+7.0%	growth parameter: operating revenue in constant dollars
49	Electric and Gas Utilities	-1.0%	-3.0%	+2.0%	+1.5%[E]	source: Standard and Poor Industry Analysis, July 1983. Growth parameter: Demand
	Misc. Service Sector Industries:[3]					
	Rapid Growth		+2.0%[E]	+3.0%[E]	+4.0%[E]	growth parameter: total employment
	Declining		-2.0%[E]	--[E]	+1.0%[E]	growth parameter: total employment

[1] Δ Indicates change.

[2] Adapted from 1984 U.S. Industrial Outlook, (Statistic = total industry shipments in constant (1972) dollars), modified to reflect industry activity in New Jersey

[E] Indicated figure not provided in Outlook. The figure represents the consultant's estimate derived from the Outlook narrative and conference with economists from New Jersey's Bureau of Demographic and Economic Analysis regarding New Jersey's industrial activity relative to that of the U.S. overall.

[3] Waste included in 2992, 4953, 7399, and 7699 which represent residuals from hazardous waste facilities are not projected. The future quantity of waste from these facilities will depend upon the future volume of waste received rather than general economic growth. Rather than applying economic growth factors in this task, the quantities of residuals are kept constant with adjustments made in Task Four depending on additional waste receipts.

TABLE 2-10

NEW JERSEY STATE-LISTED WASTES

Waste Code	Waste Name
X103	Acrylonitrile
X123	Arsenic and Compounds NOS
X126	Arsenic Trioxide
X176	Chloroform
X188	Creosote
X190	Cyanides/Soluble Salts and Complexes Of
X210	1,2-Dibromoethane
X222	2,6-Dichlorophenol
X226	1,2-Dichloropropane
X228	Dichloropropene, NOS
X239	Diethylstilbestrol
X276	Ethyleneoxide
X283	Formaldehyde
X334	Nickel and Compounds, NOS
X386	Phthalic Anhydride
X387	Polychlorinated Biphenyl, NOS
X425	Tetrachloroethylene
X442	Trichloroethene
X721	Oil Waste from Gas Stations
X722	Waste Oil and Bottom of Resin and Commercial Tank Cleaning
X723	Oil Waste of Gas Tank Clean Outs
X724	Waste Petroleum Oil of Tank Truck Clean Outs
X725	Oil Spill Cleanup Material
X726	Metal Working, Turbine, Diesel, and Quench Oils
X728	Waste Oil and Bottom Sludge of Processing Facilities
X799	Containers, Crushed Empty (Rinsed)
X825	Contaminated Soil/Sludge Aband.
X850	Packed Laboratory Chemicals
X900	Chemical Process-Liquid, NOS
X905	Gas from Chemical Process-NOS
X910	Chemical Process-Solids, NOS
X920	Food Processing, NOS
X930	Detergent, NOS

Regulation of the other 21 unmanifested "X" wastes (except for the X900 series) is not expected before the end of 1985, but is likely before 1988. Once included, an approximate twenty percent increase could be assumed to occur in manifested quantities of those wastes during the first year of inclusion over the quantities reported in the previous year (last year of non-inclusion). Changes in the manifested quantities of these waste types thereafter will depend upon industrial activity.

Regulation of the X900 series as hazardous wastes is not expected; additional increments for these wastes are not necessary. Nevertheless, these wastes can be expected to increase proportionally to the rates of industrial activity predicted for those industries generating them and continue to exert a demand on commercial facilities.

U.S. EPA. On 10 February 1984, the U.S. EPA published in the Federal Register an Interim Final Rule to regulate as a generic category a group of wastes generated during the manufacture of chlorinated aliphatic hydrocarbons. The Interim Final Rule regulates distillation residues, heavy ends, tars, and reactor clean-out wastes. Table 2-11 shows the major commercial products whose manufacturing processes generate these waste types.

EPA documentation notes that the waste types regulated under the Interim Final Rule are currently being generated by three manufacturers in New Jersey. The consultant's conversation with the EPA project officer determined that only a small percentage of waste expected to be newly manifested under this listing is expected from the New Jersey manufacturers. The quantity should only be about 500 tons. It is assumed, though, that these generators are already manifesting these wastes under a "U" or an "X" waste code. If so, this Interim Final Rule, when it becomes effective in August 1984, will probably not increase manifested quantities.

The U.S. EPA is also reportedly evaluating certain oil refinery wastes, e.g., cooling tower sludge, for inclusion. Though no formal notices have yet appeared in the Federal Register, additional wastes of this type may be expected to be included during the latter half of this Facilities Plan. The consultant estimates that an additional 10,000 tons in 1987 and 1988 may become regulated should these wastes be listed. However, the consultant's experience with petroleum refineries nationwide suggests that no more than half that quantity (or 5,000 tons) will be managed off site.

TABLE 2-11

MAJOR COMMERCIAL PRODUCTS GENERATING CHLORINATED ALIPHATIC HYDROCARBON RESIDUES

Regulated under new generic RCRA Listing F024

Carbon tetrachloride
1-Chlorobutane (n-Butyl chloride)
Chloroethane (Ethyl chloride)
Chloroform (Trichloromethane)
2-Chloro-1,3-butadiene (Chloroprene)
Chloromethane (Methyl chloride)
2-Chloro-2-methylpropane (t-Butyl chloride)
3-Chloro-2-methylpropene (Methallyl chloride)
3-Chloropropene (Allyl chloride)
Dichlorobutadiene
Dichlorobutenes
1,4-Dichlorobutyne
1,2-Dichloroethane (Ethylene dichloride)
Dichloromethane (Methylene dichloride)
1,2-Dichloropropane
1,3-Dichloropropene
Hexachlorocyclopentadiene
Tetrachloroethylene (Perchloroethylene)
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethylene (1,1,2-Trichloroethene)
1,2,3-Trichloropropane
1,2,3-Trichloropropene
Vinyl chloride (Chloroethene)
Vinylidene chloride (1,1-Dichloroethane)

Waste Delisting

New Jersey DEP does not currently receive a large amount of individual waste stream delisting petitions annually and it does not foresee any increases in their number in the next few years. New Jersey DEP also has no plans at this time to issue any blanket exclusions for waste streams in its regulations.

Based on New Jersey RCRA delisting history, it is assumed that about 1,000 tons of waste will be the subject of delisting petitions each year. Based on that assumption and the additional assumption that half of the waste (or 500 tons) involved in petitions will actually be delisted, 2,000 tons of waste should be delisted by 1988. Most of this delisting will probably affect metal sludges and oily sludges. However, manifested quantities will probably actually decrease by only 1,000 tons. Waste management patterns among New Jersey generators indicate a strong likelihood that half or more of any delisted waste will continue to be managed at commercial hazardous waste facilities.

Summary

The additional quantity of manifested wastes resulting from waste listings and delistings will affect the following treatability categories of wastes as indicated:

Treatability Category	Increase	Decrease	Net Effect
Toxic Liquids	300		+ 300
Heavy Metal Sludges	—	500	- 500
Oily Sludges	5,000	500	+4,500
Organic Solids/Sludges	200		+ 200

Waste Reduction

Some reduction of currently manifested wastes is expected to occur during the following years. Typical changes will include:

- the reduction of aqueous waste streams by improved water use,
- shift from off-site to on-site treatment,

- substitution of non-hazardous substances for hazardous constituents process streams, and

- recycling/reuse of waste streams on site, etc.

Currently, the driving forces for these changes include the liability and the economic costs associated with management of hazardous waste under existing regulations. Additional reduction will possibly depend upon new factors which could be applied, by government and/or industry, to the current management system. The factors to be applied are presently being evaluated by a Task Force formed by the Commission to examine the specific question of source reduction in New Jersey.

The Hazardous Waste Source Reduction/Recycling Task Force

One of the Commission's ultimate goals is to reduce the volume of waste that requires off-site treatment or disposal. Toward that end, the Commission's Task Force will explore various policies and the proper combination of incentives and disincentives necessary to achieve the maximum degree of reduction and recycling. The Task Force will examine a variety of legal, financial, and industrial strategies. Furthermore, the Task Force will make specific policy recommendations and work with the Commission in legislating those recommendations.

Waste Management Hierarchy

Overall, the Commission and the Task Force are seeking to develop a management hierarchy for future waste management, which, in order of preference, includes:

Source Reduction
Recycling
Recovery
Treatment and Incineration
Secure Disposal

The focus should not be solely on the industrial/commercial and research/development producers of hazardous waste but also on government, universities, and other institutions as they too are capable of source reduction.

Source reduction is any method or technique applied at the site of generation, the use of which reduces the volume of hazardous waste produced without increasing risk to the public or the environment. Examples include:

- Improved process/production control and maintenance.
- Process modification
- Substitution
- Equipment changes

Recycling is processing used material for reuse. Examples include:

- Waste exchange (some transactions)
- Batch-toll processing (solvents)
- Closed loop processing

Reuse is recycling without processing. Examples include:

- Waste exchange (some transactions)
- Neutralization/coagulation

Recovery is processing a used material to extract a usable component or to generate energy. Examples include:

- Waste exchange (some transactions)
- Material reclamation
- Fuel program

Estimates of Expected Reduction

Table 2-12 contains the consultant's engineering judgment of the changes in manifested quantities expected to occur by 1988 through source reduction. The factors for different categories of waste generated in different industries are multiplied by the results of the projections for economic growth. For example, a factor of 0.9 for a certain waste type within an SIC code reduces the waste projected for that category (based on economic growth) by ten percent. It should be noted that some factors indicate an increase in the generation of some wastes; however, net reduction overall occurs.

The waste reduction factors are based on the following sources of information:

TABLE 2-12

MULTIPLICATION FACTORS FOR PROJECTED WASTE QUANTITIES TO
REFLECT WASTE REDUCTION

	SIC Codes										
	281	282	285	286	287	289	29	33	34	35	36
Aqueous											
Inorganic	.8	.9		.8	.8	.8	.5	.7	.7	.7	.7
Organic		.7									
Solvents											
Non-Halogenated			.5						.75		
Halogenated											
Mixed											
Solvents, NOS			.5						.75		
Oils											
Automobile								.9			
Industrial								.9	.9	.75	
Fuel								.9			
Oils, NOS								.9			
Other Liquids											
Combustible											
Toxic with Metals											
Reactive											
Corrosive									.9		
Toxic with Organics											
Sludges and Solids											
Heavy Metals	1.1			.5			1.1				
Oily											
Paint			.5								
Combustible											
Corrosive											
Reactive											
Organic			.5	1.2							
Other	1.1			.5							

- The New Jersey Industrial Waste Survey prepared by IT Enviroscience, in cooperation with the Research and Development Council of New Jersey, which asked questions regarding generators' future plans.

- Extensive surveys and analysis conducted by the Minnesota Waste Management Board of wastes that are similar in many ways to New Jersey wastes. The goal of the Minnesota study was to understand the opportunity for practicable waste reduction.

- General experience with numerous generators of hazardous waste as part of other projects.

The general method for estimating the waste reduction factors in Table 2-12 involved analyzing the future changes (as suggested by the New Jersey Research and Development Council survey), correlating these findings with similar studies, such as that carried out by Minnesota, and verifying the numbers against general experience and New Jersey generators' past and present attempts at waste generation.

Regulatory Changes

Pending regulatory changes and programs potentially affecting the quantity of New Jersey's manifested wastes include:

1. Wastewater pretreatment
2. Restrictions on wastes burned in boilers
3. Waste-end taxes

Of the three, the waste-end tax is the only one having the potential to decrease manifested waste quantities. Some states have already enacted a waste-end tax; Missouri, for example, charges a tax of $25 per ton for wastes managed by land disposal. Other states have decided not to create such a tax. Whether a waste-end tax bill would come into effect in New Jersey during the time frame of this Plan cannot be determined. If one were enacted, the effect on waste generation would depend on the size of the tax. This potential influence on future waste generation must be factored if and when enacted.

Wastes generated from pretreatment, as well as those shifted to the commercial market due to restrictions on wastes burned in boilers, will probably increase manifested waste quantities. These two special components of increased demand are further evaluated in Chapter Four and added to this Chapter's figures to define total future demand for analysis in Chapter Six.

Shift From On-Site to Off-Site Treatment

Closure of on-site commercial facilities will also serve to increase the amount of waste manifested to commercial facilities. While this component is also examined in Chapter Four, instances of shift from on-site to off-site treatment are apparent in the 1983 data base. The most notable example is a shift of 42,000 tons of EPA waste type K104 from duPont's Gibbstown facility to duPont Chambers Works. This quantity alone represents a nine percent increase in 1983 manifested waste over 1982 not attributable to economics, listing/delisting, or regulatory changes. Chapter Four provides a further analysis of the expected on-site to off-site shift through 1988.

1988 PROJECTED HAZARDOUS WASTE FOR NEW JERSEY

Table 2-13 displays the 1988 projected manifested waste quantities, calculated by applying the economic projection factors only to the 1981, 1982, and 1983 quantities.[9] The application of economic projection factors to 1981 waste resulted in a forecast of 449,000 tons for 1988. Applying similar economic projection factors to 1982 and 1983 waste resulted in 391,000 tons and 451,000 tons, respectively.

It is the consultant's opinion that the differences among manifested waste quantities in 1981, 1982, and 1983 represent some permanent waste reduction. This was confirmed by reversing the economic growth/decline factors for 1981-1982 and 1982-1983 to eliminate the effects of the economy on waste generation in 1982 and 1983.[10] If the changes in waste generation were solely from economic activity, the adjusted

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9 Quantities generated as residuals from commercial facilities are kept constant. Residual quantities from commercial facilities will be altered as necessary in Chapter Six to reflect any changes in waste receipts.

10 The 1983 waste quantity used in this calculation was less the 42,000 tons identified for duPont, Gibbstown. This waste, in the data base due to closure of an on-site facility, skews the manifested quantity for 1983 because it is not new waste generated from increased production or expanded markets. It represents a change in management practice only.

TABLE 2-13

PROJECTIONS OF NEW JERSEY MANIFESTED
WASTE QUANTITIES FOR 1988
ECONOMIC RECOVERY/GROWTH
(In Thousands of Tons)

Treatability Codes	Base Year for Projection 1981	1982	1983
AQUEOUS LIQUID			
Inorganic	157	133	122
Organic	72	53	95
SOLVENTS			
Halogenated	15	11	11
Non-Halogenated	5	5	10
Mixed	0	0	0
Solvents, NOS	12	15	22
OILS			
Automobile	26	24	41
Industrial	32	36	29
Fuel	5	6	12
Oils, NOS	1	2	3
OTHER LIQUIDS			
Combustible	23	22	19
Toxic with Metals	<1	2	1
Reactive	2	<1	2
Corrosive	<1	<1	<1
Toxic with Organics	<1	2	5
SOLIDS AND SLUDGES			
Heavy Metals	24	15	37
Oily	16	7	7
Paint	7	2	<1
Combustible	4	5	4
Corrosive	4	2	3
Reactive	<1	2	<1
Organic	31	35	24
Other	2	<1	2
UNEXAMINED	10	12	2
TOTAL	449	391	451

quantities would have been about the same for all three years. However, a non-economy-related decrease in manifested waste generation of approximately fourteen percent between 1981 and 1982. A three percent increase between 1982 and 1983 yields a net reduction of eleven percent between 1981 and 1983. A larger number of base years are needed to confirm with measurable statistical precision that this reduction is permanent.

It is well-known that industry has taken steps to reduce waste generation. However, the differences among the three years also reflect waste inventorying (storage), validity of the general approach used in the analysis of manifest data, capability to treat more waste on-site in 1982 because of increased underutilization of capacity at existing on-site treatment processes, shifts between on-site and off-site management, and other similar factors. For this reason, the projected quantities for the three years were averaged on a weighted basis to produce the projected waste quantities representing future demand for commercial facilities. Fifty percent weight was assigned to 1983 projected quantities,[11] 25 percent weight to 1982 projected quantities, and 25 percent weight to 1981 projected quantities. Though quantities for each treatability category were weighted in this way, the example below illustrates the weighting on the total quantity:

1981 projected (0.25)(449,000)	112,000
1982 projected (0.25)(391,000)	97,000
1983 projected (0.50)	
(451,000-51,000 duPont)	200,000
duPont, Gibbstown	51,000
	460,000

To the resulting weighted quantities (plus the duPont Gibbstown waste of 57,000 tons), the waste reduction factors were applied to produce the forecasted waste quantities from normal industrial production and production-related activities. A reduction in the projected 1988 weighted average quantities of 33,000 tons is expected as a result of waste reduction. Further adjustment for waste listing and delisting results in

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11 The 1983 weighted quantity used for 1988 projections was less the 51,000 tons of projected duPont Gibbstown waste. This waste, in the data base due to closure of an on-site facility, skews the projected quantity of manifested waste based on economic factors. This quantity is added to the weighted projected quantity separately. Other anticipated on-site to off-site shifted waste will be added in Chapter 4.

projected quantity of 431,000 tons by 1988 represents expected demand for off-site commercial facilities. Table 2-14 displays the weighted quantities adjusted for waste reduction and waste listings/delistings by summary treatability categories. This data, along with the Chapter Four data regarding cleanup waste, increases in waste due to wastewater pretreatment and more stringent standards or burning waste in boilers, and other changes are used in Chapter Six to determine New Jersey's future hazardous waste facility needs.

TABLE 2-14

1988 PROJECTED MANIFESTED WASTE QUANTITIES
FOR NEW JERSEY
(In Thousands of Tons)

Treatability Codes	Weighted Average Projections (Economic Factors Only)	Adjustment for Waste Reduction	for Waste Listing and Delisting	Final Projected Quantities
AQUEOUS LIQUID				
Inorganic	134	-23		111
Organic	104			104
SOLVENTS				
Halogenated	12	- 2		10
Non-Halogenated	7			7
Solvents, NOS	18	- 2		16
OILS				
Automobile	33	- 1		32
Industrial	32	- 2		30
Fuel	9			9
Oils, NOS	2			2
OTHER LIQUIDS				
Combustible	21			21
Toxic with Metals	1			1
Reactive	1			1
Corrosive	<1			<1
Toxic with Organics	3		+0.3	3
SOLIDS AND SLUDGES				
Heavy Metals	28	- 1	-0.5	27
Oily	9		+4.5	13
Paint	3	- 1		2
Combustible	4			4
Corrosive	3			3
Reactive	1			1
Organic	28	- 1	+0.2	27
Other	1			1
UNEXAMINED	6			6
TOTAL	460	-33	+4.5	431

CHAPTER THREE

COMMERCIAL TSD FACILITY CAPACITY ANALYSIS

OBJECTIVE

In order to draw reliable conclusions about the need for new facilities, it is necessary to understand the capabilities of the commercial facilities presently operating in New Jersey. This Chapter presents an accurate account of existing commercial facilities in New Jersey, including number, location, capacity, compliance status, and quantity and type of waste accepted.[1]

The Chapter contains an overview of the various technologies for the recovery, treatment, and disposal of hazardous wastes. The technologies discussed include those which are being used at facilities in New Jersey plus those which have been commercially proven in other states. The discussion also addresses several technologies which are considered emerging technologies. The technology overview is not intended to address all technical aspects; the reader should refer to the Research and Development Council of New Jersey's "New Jersey Industrial Waste Study".[2] The Research and Development Council's report contains a detailed review of treatment technologies.

This Chapter singles out recovery and recycling technologies for more detailed analysis. The analysis addresses the principle technical processes, the state of development, emissions and residuals, and associated costs.

Also examined are wastes exported from New Jersey to facilities in other states as well as wastes imported to New Jersey. This assessment indicates the relative importance of New Jersey facilities as compared to facilities in other states.

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1 As of September 1984 (selected revisions March 1985).

2 See T. Busmann, et al. New Jersey Industrial Waste Study: Waste Projection and Treatment. Washington, D.C. U.S. EPA, 1984.
(Copies available through the New Jersey Hazardous Waste Facilities Siting Commission.)

OVERVIEW OF HAZARDOUS WASTE TREATMENT TECHNOLOGIES

Waste management technologies can be divided into categories per the approach used in the "New Jersey Industrial Waste Study" by the New Jersey Research and Development Council:

Chemical and Biological Destruction Technologies
Thermal Destruction Technologies
Separation Technologies
Disposal Technologies
Source Control

Table 3-1 illustrates the specific technologies addressed in the Research and Development Council's study for each of these five categories.

Chemical and Biological Destruction Technologies

Destruction technologies permanently alter hazardous materials to render them non-hazardous or more environmentally acceptable. For example, SCA Chemical Services located in Newark carries out chemical destruction of a variety of hazardous waste streams. Most destruction techniques degrade hazardous chemicals into simpler, non-toxic compounds, and all of the technologies discussed here do so by oxidation. Oxidation is a chemical change caused by contact with an excess amount of a compound known as an oxidizing agent. Common oxidizing agents are oxygen and chlorine compounds.

Biological Treatment

Biological treatment systems utilize a variety of microorganisms to oxidize waste compounds. Biological treatment systems are well-developed, having successfully treated a variety of industrial wastewater streams, and the same systems are applicable to aqueous hazardous wastes containing organics (i.e., contaminated waters). The primary process variables which characterize various biological treatment systems are the method of contacting the waste and biomass (microbes), and the degree of aeration.

Conventional Treatment Systems. Conventional systems are most applicable to aqueous waste streams of relatively constant composition, containing low concentrations of organics and some suspended solids. In the activated sludge process, the microorganisms are suspended in the liquid waste mixture by violent aeration, and the biomass is filtered from the effluent and recycled. In the trickling filter, the liquid

TABLE 3-1

TECHNOLOGIES ADDRESSED IN THE
NEW JERSEY INDUSTRIAL WASTE STUDY[1]

- Chemical and Biological Destructive Technologies

  Biological oxidation
    Suspended growth
    Attached growth
    Anaerobic
  Chemical oxidation
    Chlorine
    Oxygen
      Ozone
      Hydrogen peroxide

- Thermal Destruction

  Single chamber-liquid
  Rotary kiln
  Multiple hearth
  Fluid bed
  Chlorinated organic
  Pyrolysis
  Molten salt combustor
  Cement kilns
  Co-incineration/boilers
  At-sea incineration
  High-temperature fluid wall
  Plasma arc torch
  Magnetic furnace
  Supercritical water
  Microwave

- Separation Technologies

  Physical/chemical
    Emulsion breaking
    Density differential separators
    Filtration/coalescence
    Chemical separation
    Electrical separation
    Thermal separation

- Separation Technologies (continued)

  Volatilization
    Fractional distillation
    Steam stripping
    Evaporation
    Inert gas strippingion
  Adsorption
    Carbon
    Synthetic
  Extraction
  Liquid/solids separation
    Screening
    Clarification/thickening
    Dewatering
    Pressure filtration
    Vacuum filtration
    Belt filtration
    Centrifuge
    Membrane separation
      Dialysis
      Reverse osmosis
      Ultra filtration
      Electrodialysis
    Ion exchange

- Disposal Technologies

  Natural waters
  Deep well injection
  Stabilization
  Landfarming
  Secure landfill
  Solar evaporation

- Source Control

  Recycle/reuse

[1] See T. Busmann, et al. New Jersey Industrial Waste Study: Waste Projection and Treatment. 1984.

wastewater runs through a packed bed containing an attached microbial population and countercurrent aeration through the packed bed provides oxygen. The rotating biological contactors system uses large rotating discs which support an attached microbial growth and are only partially submerged in the waste liquid. anaerobic digestion occurs in a closed vessel in the absence of oxygen and produces methane as a degradation by-product.

Chemical Oxidation

Destructive treatment through oxidation may also be done chemically, usually employing oxygen or chlorine as the oxidizing agents. In chemical oxidation, electrons are transferred from one reactant to another and toxic constituents are converted into simpler, less toxic chemicals. Chlorinolysis, which uses elemental chlorine, bleach (sodium hypochlorite), chlorine dioxide, or bromine chloride as the oxidizing agent, may be carried out at elevated temperatures or with a catalyst to improve the oxidation rate.

The primary application of chemical oxidation has been to destroy cyanides in plating wastes, but has also been widely applied to phenols, organic sulfur compounds, and other dilute aqueous organic waste streams. Chlorinolysis is effective for treatment of waste streams containing more than one percent organics.

Thermal Destruction Technologies

Incineration technologies destroy wastes having a very broad range of compositions by exposing them to high temperatures (in the presence of air), thus effecting either partial or complete oxidation of waste material. Rollins Environmental Services operates New Jersey's only incinerator, a rotary kiln unit, in Bridgeport. The important factors in incinerator design are temperature, residence time, and turbulence within the combustion chamber. Existing federal regulations specify that an incinerator must have a destruction and removal efficiency (DRE) of at least 99.99 percent, and it has been shown that certain high-temperature destruction technologies have achieved DREs of up to 99.9999 percent. New Jersey DEP further requires a 99.9 percent combustion efficiency. Incineration is particularly useful for recalcitrant chlorinated organic waste streams.

There are many high-temperature destruction technologies available for various applications. However, two designs account for the vast majority of existing commercial hazardous waste incineration facilities: rotary kiln and liquid injection.

√ Rotary Kiln Incinerator

The rotary kiln incinerator consists of a large rotating refractory-lined cylinder, which is inclined. The liquids, sludges, and solid or containerized wastes are fed into the higher end of the kiln, where burners using fuel or fuel blended with high heating value waste maintain a temperature between 1,500°F and 3,000°F, depending on particular design. The waste is agitated by the rotating action of the kiln which is of sufficient length to reduce the wastes to ash. The ash cools and collects at the low end of the kiln. Gaseous products are further destroyed in a secondary combustion chamber, followed by air pollution control equipment such as a scrubber. Rotary kiln incinerators have the advantage of being able to accept solid, liquids, or bulk containerized wastes. A wide variety of organic wastes such as distillation bottoms, solvent and paint wastes (halogenated and non-halogenated), pesticides, and almost any waste which does not contain a very high amount of inorganic material can be incinerated in a rotary kiln.

√ Liquid Injection Incinerator

Liquid injection incineration is another well-developed, high-temperature destruction technique. Incinerators of this type usually have a single refractory-lined chamber equipped with atomizing nozzles through which wastes and supplementary fuels are pumped. A secondary combustion chamber may be present as well as air pollution control equipment. These systems can burn nearly any combustible liquid organic waste at temperatures ranging from 1,300°F to 4,000°F. Low heating value wastes are blended with fuels or high heating value wastes to facilitate smooth operation and complete combustion.

Shipboard incineration at sea uses this design, except that air pollution control equipment is not required. It is claimed that the immense buffering capacity of the ocean negates any adverse environmental effects potentially posed by combustion products.

Other Commercially Proven Thermal Destruction Technologies

There exist three other thermal destruction technologies which are commonly employed in applications other than the hazardous waste management industry. These processes offer promising potential in the search for treatment methods for specific wastes and recalcitrant compounds.

Multiple Hearth Incinerator. The Multiple Hearth Incinerator is a large vertical refractory-lined cylinder with several hearths located above each other within a shell. "Rabble arms" convey the wastes, starting at the top hearth, from each hearth to the next hotter hearth below. Because solids and volatilized gaseous components of the waste flow countercurrently, waste gases generated from the top hearth may not receive high-temperature exposure adequate for complete combustion. The use of multiple hearth incinerators is limited to solid and sludge-like hazardous wastes which are easily burned.

Fluidized Bed Incineration. This well-developed technology is presently used to destroy various types of municipal and industrial waste sludges. Preheated air passing through a perforated plate fluidizes a bed of inert granular material at temperatures up to 2,100°F. The violent air flow mixes the waste to facilitate combustion and the granular bed acts as a substantial heat source as well as a dry scrubber to reduce the need for pollution control. Fluidized beds are not suitable for solid wastes or wastes containing high levels of chloride.

Wet Air Oxidation. This is a commercially proven technology that involves oxidation reactions which are essentially the same as combustion reactions, but occur in the liquid state. This technology is generally applicable to cyanides and aqueous organic streams which are too dilute to incinerate and too toxic to treat biologically.

Emerging Thermal Destruction Technologies

Other, less developed, but promising emerging thermal destruction technologies include molten salt destruction, pyrolysis, high-temperature fluid wall incineration, plasma arc incineration, and supercritical water treatment.

Molten Salt Destruction. This method injects solid, liquid, or gaseous wastes under a pool of molten salt at 1,500°F to 1,800°F, thus effecting immediate combustion of the wastes.

Ash residue and most of the gaseous reaction products are retained in the salt which must be replaced periodically to remove these impurities.

Pyrolysis. Pyrolysis occurs when waste products are exposed to high temperatures in the absence of oxygen. The equipment used in pyrolysis is similar to incineration equipment with special provisions to prevent air from entering the pyrolytic chamber.

High-Temperature Fluid Wall Incineration. This method passes waste through a vertical tube at temperatures above 4,000°F. This high-temperature exposure provides little chance for undesirable side reactions and creates virtually no products of imcomplete combustion (PICs).

Plasma Arc Incineration. In this method, wastes are exposed to a gas which has been electrically excited to its plasma state, sometimes creating temperatures in excess of 90,000°F. This system achieves greater DREs than other technologies, or essentially total destruction.

Supercritical Water Treatment. This method consists of dissolving wastes in water above its critical point of 374°F and 218 atmospheres of pressure. Under these conditions, water becomes an excellent solvent for many types of organic wastes, breaking them down into simpler compounds. Furthermore, supercritical water will not dissolve salts, thus making this technology suitable for wastes high in salt content and with too low of an organic content to support incineration.

Separation Technologies

Separation technologies are used to separate the hazardous and non-hazardous components of waste streams. These methods allow the recovery of waste components, reduce the volume of waste, solidify wastes, and remove soluble and suspended constituents from liquid waste streams. For example, Oil Recovery Company in Clayton, New Jersey utilizes the separation processes of screening, gravity separation, filtration, and flocculation in its fuel blending facility.

Physical Separation

The simplest types of physical separation technologies, filtration and sedimentation, are based on particle size and density. Filtration processes involve separating the solids from the liquids by forcing the liquid through a screen, cloth, or sand filter by gravity, pressure, or a vacuum. Gravity separation (flotation or sedimentation) works for many industrial wastes; oil and grease tend to rise naturally to the surface where they can be skimmed off. In sedimentation processes, heavy solid particles are allowed to settle out of the suspension, and the fluid can then be removed from above the solids. Flocculation is used when the suspended particles are too small for either sedimentation or filtration; the addition of flocculating chemicals, such as alum, can aid in aggregating very small particles.

Component Separation

Component separation techniques rely on such characteristics as boiling points and electrical charges. Processes such as distillation, stripping, and evaporation all use boiling point differences. Distillation processes separate the more volatile (lower boiling point) materials by boiling them off and collecting them. Evaporation is used to separate a solvent in vapor form from solids or slurries.

Carbon absorption, electrolysis, and ion exchange procedures are based on electrical properties. Activated carbon is used to remove dissolved organic wastes from water. When the carbon comes into contact with these materials, it holds them either at the surface or internally. The spent carbon can be reactivated by thermal treatment. Electrolysis separates positively and negatively charged particles by using an electrical current. This process is frequently used on metal ions in aqueous waste streams. Ion exchange systems are similar to carbon adsorption except they employ resins which can be designed for selective removal of ionic (charged) compounds.

Chemical Separation

The most common chemical separation technologies involve precipitation. Neutralization or pH adjustment is accomplished by adding acidic or basic feedstocks to corrosive wastes, depending upon their pH. Precipitation is a chemical process which converts a waste stream with soluble constituents into one with insoluble constituents. This is often accomplished by pH adjustment, but usually to a different pH than with neutralization, e.g., adding lime or sodium hydroxide to elevate the pH of certain wastes causes heavy metals to settle out.

Land Disposal Technologies

Most treatment technologies generate residues which require some form of disposal. These wastes have traditionally been buried in secure landfills, with or without stabilization, or injected down deep wells. No commercial land disposal facility for hazardous wastes is presently operating in New Jersey. Two emerging technologies are receiving increased attention: aboveground storage and mined repository.

Secure Landfills

Secure landfills are designed and operated to contain buried wastes, to minimize the generation of leachate, and to remove leachate as it is generated. Long-term landfill performance is determined by the design standards, the hydrogeological characteristics of the site, the types of waste, the daily operations at the site, and the post-closure maintenance and monitoring procedures. The design standards provide for liners, a top cover, and a leachate collection system. Bottom liners are constructed of compacted clay and/or synthetic membranes, with a drainage bed placed above the bottom liner to collect leachate. The design of the final cover is important to reduce infiltration of precipitation into the closed landfill.

Landfilled wastes are generally bulk and drummed solids and sludges which are segregated chemically to insure compatibility. Highly reactive, volatile and ignitable materials, as well as bulk liquids, are not legally allowable wastes for landfill disposal. The U.S. EPA is investigating what other wastes should be excluded from landfills based on such aspects as the toxicity, mobility, and persistence of waste.

Stabilization/Solidification

Stabilization/solidification techniques bind semi-solid wastes into a solid material. The cement-based and pozzolanic processes are most commonly used to treat inorganic sludges and metal-bearing wastes. Wastes containing more than ten to twenty percent organic content are generally not good candidates for these processes.

In the cement-based process, the wastes are stirred in water and mixed directly with cement. In the pozzolanic process, the wastes are mixed with fine-grained siliceous (pozzolanic) material and water to produce a concrete-like solid. The most common materials used are fly ash, ground blast furnace slag, and cement kiln dust.

Solidification processes generally do not chemically change the waste itself, but improve the handling and reduce the mobility of the waste. In the stabilization process, physical characteristics of the waste may not change, but the contaminants are altered by chemical binding. The binding either induces a chemical change to produce an insoluble form or it captures the waste in an insoluble matrix or crystal lattice.

Stabilization/solidification thus reduces the mobility of waste constituents in a landfill environment. The U.S. EPA has determined that some stabilized/solidified wastes can be managed as non-hazardous wastes and has removed several stabilized metal finishing wastes from their hazardous waste list on a generator-specific basis.

Landfarming

Landfarming involves applying wastes to the land at controlled rates. The soil system constitutes the treatment medium for degrading or immobilizing the wastes by a variety of physical, chemical, and biological processes. Applied organics are removed by the biological activity of the soil microorganisms; this occurs at the soil surface or within the top several inches of the soil profile. Suspended solids are removed by physical settling and filtration on the soil. Heavy metals are removed principally by adsorption onto soil colloids, precipitation, and ion exchange in the soil.

Many organic hazardous and non-hazardous wastes can generally be treated by landfarming, although oily wastes are the most common candidates for this process. Metal concentrations in the waste are critical and can reduce the life of a landfarm site. The applicability of the treatment process also depends upon buildup of salts in the soil.

Successful operation of a landfarm requires (1) controlling the migration of waste constituents, particularly heavy metals to the ground water, (2) maintaining waste loading rates below the levels of biological and phytotoxicity levels, and (3) properly managing storm water runoff.

Deep Well Injection

Deep well injection involves pumping industrial fluids into a porous formation between impervious layers of rock where the wastes become permanently stored. The injection zone may be several hundred feet to a mile beneath the earth's surface. This method has been used extensively in Texas, Louisiana, Ohio, and other states for the disposal of oil field brines, pickling and plating wastes, and by-products from organic chemicals production.

Suitable geologic conditions for deep well injection seemingly do not occur in New Jersey. Also, New Jersey State regulatory agencies feel that more appropriate treatment methods are readily available. For these reasons, it would be very difficult to obtain a permit for this type of disposal.

Aboveground Storage

Aboveground storage facilities provide long-term storage of hazardous wastes. They facilitate monitoring of the wastes and allow the wastes to be retrieved when economical methods for the recovery or destruction of the wastes are developed. Such facilities consist of lined tanks for bulk liquids and specially designed buildings for drummed wastes, similar to industrial warehouses. Currently, aboveground storage is being practiced for short-term and medium-term storage. For example, any storage of wastes by generators for more than ninety days must be permitted by RCRA; some generators have been storing PCBs in drums for several years. Long-term storage would involve the same technical concepts with additional considerations regarding drum and tank life.

Underground Repositories

Underground vaults constructed in relatively unfractured, stable rock formations below ground water supplies could serve as long-term retrievable storage or be readily converted to a permanent isolation facility by backfilling. Industrial companies currently store hazardous chemical products in salt cavities and gaseous propane in underground vaults.

A hazardous waste management company proposes to develop, in a Louisiana salt dome, a large facility that could receive wastes transported by ships. The Minnesota Waste Management Board researched at length the concept of a crystalline bedrock repository. However, the Board recently decided to drop further consideration of this concept because it was an unproven technology and because of the potential for bedrock conditions to vary unpredictably, even over short distances.

Source Control

Source control refers to methods used to reduce the hazardous nature or quantities of wastes at their original source of generation. One large category of source control techniques is on-site treatment. The methods are similar to those used at commercial off-site facilities but are operated on site by a waste generator. Examples include metal and acid recovery and recycling systems at metal finishing plants or neutralization and biological treatment systems typically used by pharmaceutical manufacturers.

A second category of source control techniques is based on reducing the amount of waste produced. By altering production processes or substituting different raw materials, a generator may be able to change the hazardous nature or reduce the quantity of hazardous wastes produced. An example of the former is the replacement of a halogenated extraction process solvent with a non-halogenated solvent. Substitution of one product for another may also eliminate a hazardous waste altogether. These source control methods are invariably specific to a certain process and can, therefore, only be applied on a case-by-case basis.

Types of Facilities

The technologies discussed in this section, as well as many other minor technologies, may be used in different combinations to create a waste management facility. Table 3-2 further clarifies this distinction by detailing the various technologies used by different types of facilities.

TYPES OF FACILITIES FOR RECOVERING AND RECYCLING WASTES

Many of the technologies discussed in the previous section can be combined or used singularly at commercial facilities to recover materials in waste as well as energy values. This section gives special attention to these recovery facilities, discussing the technical aspects and economics of recovery and its general applicability to New Jersey waste types. Materials that can be recovered include solvents, oils, acids, and metals. Energy can also be recovered through the use of co-incineration and fuel blending techniques.

TABLE 3-2

TECHNOLOGIES USED BY VARIOUS FACILITY TYPES

Facility Type	Waste Treatment Technologies
Incineration	May include any thermal destruction method, with or without heat recovery
Fuel Blending	Emulsion breaking, filtration, evaporation, screening, filtration, centrifugation, gravity separation
Waste Oil Refining	Emulsion breaking, gravity separation, distillation, steam stripping, evaporation, screening, filtration, centrifugation
Solvent Recovery	Gravity separation, fractional distillation, steam stripping, evaporation, screening, filtration
Aqueous Treatment	Biological treatment, chemical oxidation/reduction, emulsion breaking, gravity separation, chemical separation, adsorption, extraction thickening, centrifugation, filtration, membrane separation, chemical precipitation/neutralization
Metals Recovery	Chemical separation, electrical separation, evaporation adsorption, extraction, chemical precipitation/neutralization, membrane separation, ion exchange
Stabilization	Chemical separation, dewatering, filtration, chemical precipitation/neutralization, solidification
Land Disposal	Landfill, with or without stabilization/solidification
Landfarm	Landfarming

Material Recovery Facilities

Solvent Recovery

Solvents are used in many industrial processes in New Jersey. Contaminated solvents can be treated to separate the contaminants by a number of technologies including distillation, solvent extraction, adsorption, filtration, and evaporation. Distillation (batch, continuous, or steam) is used by most commercial solvent processors.

Process Description. In distillation, the volatile mixtures of solvents are exposed to increasing amounts of heat and the more volatile (lower boiling point) components of the mixture are vaporized. The vapor is then condensed. Depending on the efficiency of the system and the purity of the solvent required, repeated distillation might be required. Typically, 75 percent of a batch can be recovered. The residue, known as still bottoms, becomes a waste product and can be a liquid or sludge, depending upon a number of conditions.

The success of the recovery depends on the types and amounts of impurities. Contaminants with boiling points close to that of the solvent are more difficult to separate. An increase in the concentration of impurities also affects the recoverability. The presence of too many solids requires the addition of extra filtration steps.

Typical solvent recovery facilities require a minimum amount of land. There usually is included an office building, an unloading dock, storage area for waste and reprocessed solvents, and the reprocessing area. Curbing and diking is required to contain any leaks or spills. Distillation processes require a still (or distillation column), pumps, a steam generator or other heat source, and heat exchangers.

State of Development. Distillation technology is very well developed with few technical problems. Most recovery facilities are small (five million gallons per year). There is little economy of scale; consequently, it is often economical to have an on-site recovery unit for any large quantities, dependent upon other considerations.

New Jersey has six presently-operating commercial facilities which recover solvents. For example, Marisol, Inc. produces lacquer thinner, safety solvents, hydraulic fluid, and fuels from pharmaceutical, food, and electronic waste solvents. Solvent Recovery Service of New Jersey, Inc. specializes in tolling, i.e., custom distillation where the recovered solvent is returned to the generator for reuse. SCA Chemical Services is permitted to recover solvents but is not presently doing so, and McKesson Envirosystems is temporarily out of operation.

Emissions and Residuals. Solvent recovery can produce some air and wastewater emissions. Odors, primarily from the storage area rather than the processing area, can be mitigated by closing systems and adding vapor collection systems. The wastewater from wash downs and steam strippers is collected and treated on site being being discharged to a publicly-owned treatment works (POTW) sewer. Pretreatment methods could include filtration, phase separation, and biological treatment. Spills can be contained with proper diking and concrete pads.

The distillation process produces two types of residuals. The ash from the boilers and some still bottoms are disposed of in secure landfills. Often still bottoms have a BTU (British Thermal Unit) value and can be incinerated or even blended as fuels.

Economics. Solvent recovery costs vary widely and depend on the purity of the waste to be recovered. In some instances, the solvent recovery facility is willing to pay up to $1.50 per gallon for high-quality waste solvent due to its high resale value. In many cases, though, the solvent recovery firm may charge up to $2.00 per gallon to remove a waste solvent.

Oil Recovery

Used lubricating oils can be recovered to produce lubricating oils of quality equal to virgin oils. This process is typically referred to as oil re-refining. The term oil recovery refers to re-refining as opposed to the larger practice of fuel blending.

Process Description. Two methods may be employed in waste oil re-refining: the acid/clay method or the distillation method. The acid/clay method involves the evaporation of waste oil from solids, the addition of acid to break emulsified water from the oil, and clay to absorb and adsorb any impurities or oil additives present. Flocculants are often added to facilitate settling of suspended solids. The water, clay, and precipitates are then removed by filtration or centrifugation. The distillation method, by far the most capital-intensive method, involves a pretreatment step to remove solids and sludges, a distillation step to isolate desirable long chain hydrocarbons, and a finishing step which is simply using chemical additives to enhance the lubricating characteristics of the oil.

State of Development. Oil re-refining was widely practiced during World War II when virgin oil was scarce. Since then oil re-refining operations have become rare, with greater availability of virgin oils. A great majority of the oil re-refining operations have utilized the acid-clay method, and it is, therefore, a technology which is well-understood and well-developed. Oil distillation technology, in general, is also a well-developed technology but its application to oil re-refining can present problems with fouling and side reactions.

Emissions and Residuals. Residuals from the acid/clay method include decanted water, which may be treated in a conventional wastewater treatment system, and the oily clay sludge that is separated. Costs for disposal of this residue have made this method less popular. Residuals from distillation re-refining include settled solids and distilled water and impurities. The wastes from this method are much easier to deal with than those from the acid/clay method.

Economics. Neither of the two oil re-refining methods is, at present, an economically attractive recovery technique. The acid/clay method is less expensive to operate but disposal costs of the voluminous residuals from the process have driven up overall costs. The distillation method is an energy-intensive process with a much smaller quantity of residuals, but seemingly is economically infeasible until the price of reclaimed oil increases further or the cost of purchasing waste oils (now about $0.20 to $0.30 per gallon) decreases. More stringent regulation of fuel blending, a competitive use of waste oil, should make oil re-refining more attractive.

Acid Recovery

Process Description. Acid recovery processes are designed to recover either the free acid or both free acid and metal salts. The major source of contaminated acids is the steel industry which removes surface scale and rust from iron and steel by immersion in an acid bath (pickle liquor). Ninety percent of the spent pickle liquor is hydrochloric or sulfuric acid.

Two methods are available for recovery of spent sulfuric and hydrochloric acid liquor. Cooling of the liquor results in separation of ferrous sulfates or ferric chloride crystals which are separated by centrifugation. The second process involves roasting of the iron salts to produce iron oxides and either sulfur dioxide gas or hydrogen chloride gas. The gases are then regenerated as acids for recycling. The crystallization method is by far the more commonly used method of recovery.

Economics. Spent pickle liquor represents a significant volume of New Jersey's hazardous waste that can be substantially reduced through recovery and recycling. Nevertheless, economics represents a major barrier to wider application. The economics of acid recovery are based on cost and availability of acid, costs of disposing spent pickle liquor, and the market value of the by-products. Acid recovery may cost from $25 to $50 per ton, with by-products yielding a resale value from $0 to $10 per ton. Presently, neutralization at aqueous waste treatment facilities with land disposal of the treated residues is more attractive than risking a major capital investment in acid recovery technology to serve the troubled steel industry.

Metals Recovery

A number of wastes have been listed or declared hazardous because they contain one or more, frequently more, of the following RCRA metals, sometimes in low concentrations:

Arsenic	Lead
Barium	Mercury
Cadmium	Selenium
Chromium	Silver

Process Description. These wastes may be rendered nonhazardous by recovering these metals using many of the same processes developed and practiced in production by the chemical process industry. These processes include neutralization/precipitation, evaporation, electrolysis, ion exchange, and reverse osmosis. The wastes applicable to metals recovery are typically generated by electroplating, surface finishing, and printed circuit board production.

The method of recovery is dependent on the specific wastes present, the concentration, and the number of contaminants. Metals recovery chemistry is complex and frequently will use two or more processes. Since the process and equipment is specific to each waste stream, there is no typical metal recovery concept other than the three general steps of: (1)

extraction (typically dissolution) of metals to be removed, (2) rejection of impurities, and (3) concentration (upgrade) of the recovered metal.

State of Development. Currently, several metals recovery facilities in New Jersey recover gold (Vanguard Research Associates) and silver (Crown Bullion, Drew Metalex, Madison Industries). These facilities are not currently considered hazardous waste facilities but their status is under discussion by New Jersey DEP. Pass Recovery, a registered commercial facility, recovers lead from scrap and CP Chemicals, also authorized, uses spent nickel and copper solutions as raw materials. Some Pennsylvania facilities recover zinc from electric arc furnace dusts.

Most metals recovery practiced in the nation is done at the source, as somewhat widely practiced by the electroplating industry with reuse of the recovered metal in the production process. One of the more common metals separation techniques involves passing metal-bearing liquid wastes through a series of ion exchange canisters of varying selectivity. While one set of canisters is being used, a comparable set would be regenerated, producing a highly concentrated backwash water. The U.S. EPA has funded research of a process for greater than 99 percent extraction and recovery of copper, zinc, chrome, and nickle from mixed wastes with the process now being demonstrated at a metal finishing and plating plant in California.

Economics. Treatment and recovery costs averaged several dollars per thousand gallons of metal-bearing liquid, but there is a large cost range, depending on waste characteristics. Metals recovery has proven economically feasible with some nickel, chromium, and silver-bearing wastes. Nevertheless, major barriers to wider application exist:

1. The waste usually must be rich in the particular metal to be recovered, nearly absent in contaminants that would interfere with recovery, and particularly large in volume to produce economies of scale; hazardous wastes typically do not meet any of these conditions.

2. Land disposal frequently is considerably less expensive than recovering the metals and thereby rendering the waste non-hazardous.

Factors that may make metals recovery more attractive include more stringent limits on metals in wastewater, rising costs of raw materials, and growing pressure to discourage land disposal of hazardous waste.

Energy Recovery Facilities

Fuel Blending

Blended fuel products can be made from wastes either by blending different wastes with high BTU values or by mixing additional fuel oils with wastes. Typical waste streams with high BTU value are waste oils, solvents, and distillation bottoms. The uses for blended fuel include industrial boilers, cement kilns, and incinerators.

Process Description. Waste oils normally need pretreatment to remove bottoms, sediments, and water (BS&W). The removal of the water is achieved through separation and dehydration. The bottoms and sediments that do not settle upon storage require removal by filtration. The final products after blending must meet American Society of Testing and Materials (ASTM) specifications on bottoms, sediments, and water in fuel oils.

Waste oils for fuel blending are generated by many industries. These oils include used lubricating oils, cooling oils, cutting oils, transmission oils, and non-PCB transformer oils. Sources for solvents include solvent cleaners, spent extraction solvents, and other solvents from chemical processing industries. Distillation bottoms are the residue from solvent recovery operations. The limitations on using these wastes include bottoms, sediments, and water concentrations, whether or not the impurities are ignitable, the viscosity of the wastes, and the presence of toxics.

State of Development. Fuel blending is a simple process which is well-developed. Commercial facilities operate on throughputs as small as 5,000 gallons per day. There are currently eleven operating commercial fuel blending facilities in New Jersey. Two fuel blending facilities are being constructed and another has recently ceased operations. For example, the Oil Recovery Company recovers fuel grade oil from waste lubrication oil using the following processes: heating, screening gravity separation filtering, chemical flocculation, and blending. L&L Oil Service recovers No. 4 and No. 6 grade fuel oil from waste motor oils and various lubricating oils using gravity separation and dehydration.

Emissions and Residuals. A fuel blending facility generates air and water emissions, plus some residuals. The small amount of wastewater removed from waste oils would contain organics and some heavy metals; however, these concentrations should be sufficiently low to permit discharge into publicly-owned treatment works (POTWs). Possible air emissions could result from evaporation from the storage tanks, but could be mitigated by vapor collection systems. The residuals normally are less than ten percent of the wastes processed, and land disposal is normally the method used.

Economics. Fuel blending in New Jersey has grown with the past increases in virgin fuel costs and is presently in a relatively stable position. Treatment in this industry is simple and inexpensive. Fuel blenders pay up to $0.20 to $0.30 per gallon for collected waste oils and may sell the final product for 85 percent of virgin fuel costs.

Co-Burning in Cement Kilns and Boilers

Blended fuels (see preceding description of fuel blending) and some waste organic liquids or semi-liquids with sufficient heating value are frequently burned in kilns used to manufacture cement or in industrial boilers used for heating and steam production.

Cement Kilns. The manufacturing of cement, light aggregate, and some other products use a special type of rotary kiln. The destruction of hazardous wastes by co-burning with primary fuels and raw materials in industrial kilns has been proven effective in studies by the U.S. EPA. The kilns operate at high temperatures (2,600 to 3,000°F) and provide long residence times, which make possible very high destruction of principal organic hazardous constituents (POHCs). Theoretically, a kiln could be fired solely on waste feed as long as the waste mix has sufficient heating value.

The alkaline environment of a cement kiln neutralizes the hydrochloric acid gases produced from the burning of chlorinated waste. Typically, additional air pollution control equipment is not required. Most ash and non-volatile heavy metals are incorporated into the clinker (product of the kiln) and eventually into the cement product.

Co-burning in kilns is widely practiced. Although New Jersey has no cement kilns, New Jersey generators have manifested waste to cement kilns in Pennsylvania, New York, and Virginia.

Boilers. Blended fuels are also co-incinerated with a primary fuel in some industrial boilers. When the boilers are at the site of the waste generator, the advantages include energy recovery and elimination of transportation risks. Industrial boilers usually feature a liquid injection design. The incorporation of blended fuels sometimes creates the need for additional maintenance and air pollution testing. Problems encountered include corrosion of metal parts when halogenated wastes are burned and incomplete combustion of some wastes; however, boilers represent large capital investments and owners are usually careful with what they burn.

The U.S. EPA estimates that nationally 40,000 industrial boilers are used to burn hazardous waste.[3] An extensive national survey of nearly 25,000 facilities is being carried out by the U.S. EPA to identify those that burn used oil and waste oil or waste-derived fuel materials. The Chapter Four Report documents the information available from New Jersey DEP about the extent of this practice in New Jersey; at least twelve generators report burning wastes in boilers.

The only waste stream associated with co-incineration in boilers is the combustion gas exhaust, which may or may not require air pollution control equipment. It is rare for boilers to require the extensive air pollution control equipment used on incinerators since the fuels burn to complete combustion much easier than incinerated wastes. Extensive research by the U.S. EPA on burning of hazardous wastes in boilers indicates that destruction/removal efficiencies can surpass 99.99 percent for principal organic hazardous constituents (POHCs).[4] Even so, heavy metal emissions can be significant and the practice of co-incineration should be well controlled and regulated to avoid burning of highly toxic and refractory compounds. The U.S. EPA expects that Congress will remove the current exemption for this practice with new regulations drafted by the U.S. EPA. In advance of U.S. EPA initiatives, the New Jersey DEP has drafted more stringent fuel standards. Future trends, therefore, are uncertain.

Economics. The sole motivator for a generator to use this type of technology is cost savings. A waste generator might pay up to $1.00 per gallon to incinerate wastes at a commercial facility. Instead, the generator could burn the waste on site at no cost or even charge a small fee to have high BTU wastes removed by a fuel blender. For a fuel user, the cost of quality blended fuel with high heating value may be fifteen percent less than virgin fuel.

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3 Communication with U.S. EPA, Office of Solid Waste.

4 Incineration and Disposal of Hazardous Waste, Proceedings of the Tenth Annual U.S. EPA Research Symposium. Fort Mitchell, Kentucky. April 3-5, 1984.

Incineration with Steam Generation

An additional method of energy recovery involves production of steam in a waste heat boiler such as a rotary kiln incinerator, a liquid injection incinerator, or an industrial boiler (see Co-Burning in Kilns and Boilers). This technology can use a wide variety of incinerable wastes and closely resembles the incineration technologies with the exception that the incinerators must be designed and built for the purpose of heat recovery with a heat exchanger and associated piping. It is necessary to locate the incinerator adjacent to a potential steam user, as is frequently done in siting the acclaimed European incineration facilities.

This technology requires the same air emission control, e.g., flue gas treatment, scrubbers and electrostatic precipitators, as with incineration without steam generation. Incinerator and boiler design is well-understood. However, corrosion of the boiler heat exchangers frequently presents a problem.

The economics of the process are dependent on sufficient quantities of incinerable waste plus a demand for the steam. To be economical, the operation must produce high-pressure steam (500 to 600 psi), and the incinerator must be located within 1,000 feet of a large steam user. Further, a steam user will need to coordinate the utilization of the steam with the incineration operation. The sale of generated steam can reduce total incineration costs by 25 percent after accounting for the investment made in the added equipment. An optional method of energy recovery involves the co-generation of electricity for sale to a utility.

COMMERCIAL FACILITIES OPERATING IN NEW JERSEY

Information about the number, location, capacity, and legal status of commercial hazardous waste treatment, storage, and disposal facilities was obtained from data at the New Jersey DEP Bureau of Hazardous Waste Engineering, interviews with personnel affiliated with the facilities, and previous studies done by the consultant and other organizations.

Overview of Facilities

Number of Facilities

In 1982, 34 commercial facilities were authorized by the New Jersey DEP. Three of these no longer accept hazardous wastes, three have not yet commenced full operation, one is temporarily out of operation, and one facility is a limited activity treatment facility.[1] In 1984, two additional facilities received operating authorization from the New Jersey DEP. Thus, at present, there are 28 fully operational commercial hazardous waste facilities in New Jersey.

Capacity of Facilities

The facilities collectively offer a wide range of treatment options. Nevertheless, almost all of the facilities are either just storage/transfer operations or offer only a specialized service appropriate for a narrow range of waste types.

Seven facilities currently operate resource recovery facilities, eleven of which are oil recovery/fuel blending facilities, with six facilities involved in solvent recovery, and one metal recovery facility. Three facilities treat aqueous wastes, three only transfer or rebatch wastes (S&W Waste, Advanced Environmental Technology Corporation, and Philip A. Hunt Chemical Corporation), and one incinerates wastes. Five facilities are involved in treatment of unique waste streams and cannot be categorized. There are, at present, no commercial land disposal facilities in New Jersey.

Table 3-3 presents an estimate of the capacity, in terms of throughput in tons per year, of the 36 commercial facilities in New Jersey. Most of the information on capacity reflects capacities quoted by facility personnel, confirmed where possible with data in New Jersey DEP files. These capacities do not reflect any future expansion plans which facilities may have. Also, it should be noted that some of these facilities have closed.

Location of Facilities

Figure 3-1 shows the location of the authorized New Jersey facilities, keyed to the identification number listed. The facilities are concentrated around the two major metropolitan areas in New Jersey, with 10 facilities within 30 miles of Camden and 21 located within 30 miles of Newark.

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5 Reichhold Chemicals, Inc. burns one specific off-site waste stream in its plant boilers.

TABLE 3-3

ESTIMATED THROUGHPUT CAPACITY OF COMMERCIAL FACILITIES IN NEW JERSEY
(tons per year)

	Aqueous Treatment	Incineration	Oil Recovery/ Fuel Blending	Solvent Recovery	Transfer/ Storage	Other	Manifested Waste Received 1981	1982	1983
Advanced Environmental Technology					14,000		2,200	1,800	2,300
All County Environmental[3]			20,000				11,800	10,200	7,800
B&L Oil Corporation			15,000				11,800	9,900	14,900
BP North American[2]			11,000				0	0	0
Baron Blakeslee, Inc.				24,000			600	300	500
Browning-Ferris Industries[3]					13,000		4,500	800	0
C. P. Chemical Corporation						4,000	0	0	3,400
C. R. Warner, Inc.			20,000				0	0	<50
Cylinder Maintenance Corporation						Note[1]	0	<50	200
Detrex Chemical Industries				1,000			100	200	200
E. I. duPont de Nemours and Co.	150,000[4]						157,800	98,900	155,000
Emergency Technical Services						<50	<50	<50	<50
Flowen Oil Company			18,000				0	2,500	9,400
Kit Enterprises[3]	Note[1]						30,300	3,400	0
L&L Oil Services			18,000				7,500	8,900	8,800
Lionetti Waste Oil Service			13,000				7,900	6,800	13,500
Marisol, Inc.				43,000			18,800	14,100	13,300
McKesson Corporation[2]					Note[1]		0	0	0
McKesson Envirosystems[5]				16,000			24,600	9,500	0
Modern Transportation	42,000						43,000	9,700	1,500
Noble Oil Company			32,000				100	9,100	17,000
Oil Recovery Company, Inc.			219,000				16,000	19,300	12,800
Pass Recovery Systems, Inc.						300	<50	100	300
Perk Chemical Company				2,100			800	500	700
Philip A. Hunt Chemical					5,000		0	0	0
PITCCO			Note[1]				1,200	1,400	1,400
Pure Stream, Inc.			2,400				2,600	1,900	4,000
Reichhold Chemicals, Inc.						11,500	400	300	0
Rezultz, Inc.[2]					Note[1]		0	0	0
Rollins Environmental Services		35,000					26,700	26,900	22,200
SCA Chemical Services	200,000		45,000	50,000			65,600	43,600	50,500
S&W Waste			30,000		35,000		11,200	10,600	20,600
Safety-Kleen Corporation				23,000			0	1,300	18,300
Solvent Recovery Services				40,000			23,300	19,700	23,200
Standard Tank Cleaning	17,000						7,000	8,400	11,800
Underwater Technics						Note[1]	<50	600	200
Column Totals (rounded)	409,000	35,000	443,000	199,000	67,000	15,800	475,900	320,700	413,600

[1] Information not available
[2] Future operation
[3] No longer accepting hazardous waste
[4] Excluding projected capacity for on-site wastes
[5] Temporarily out of operation

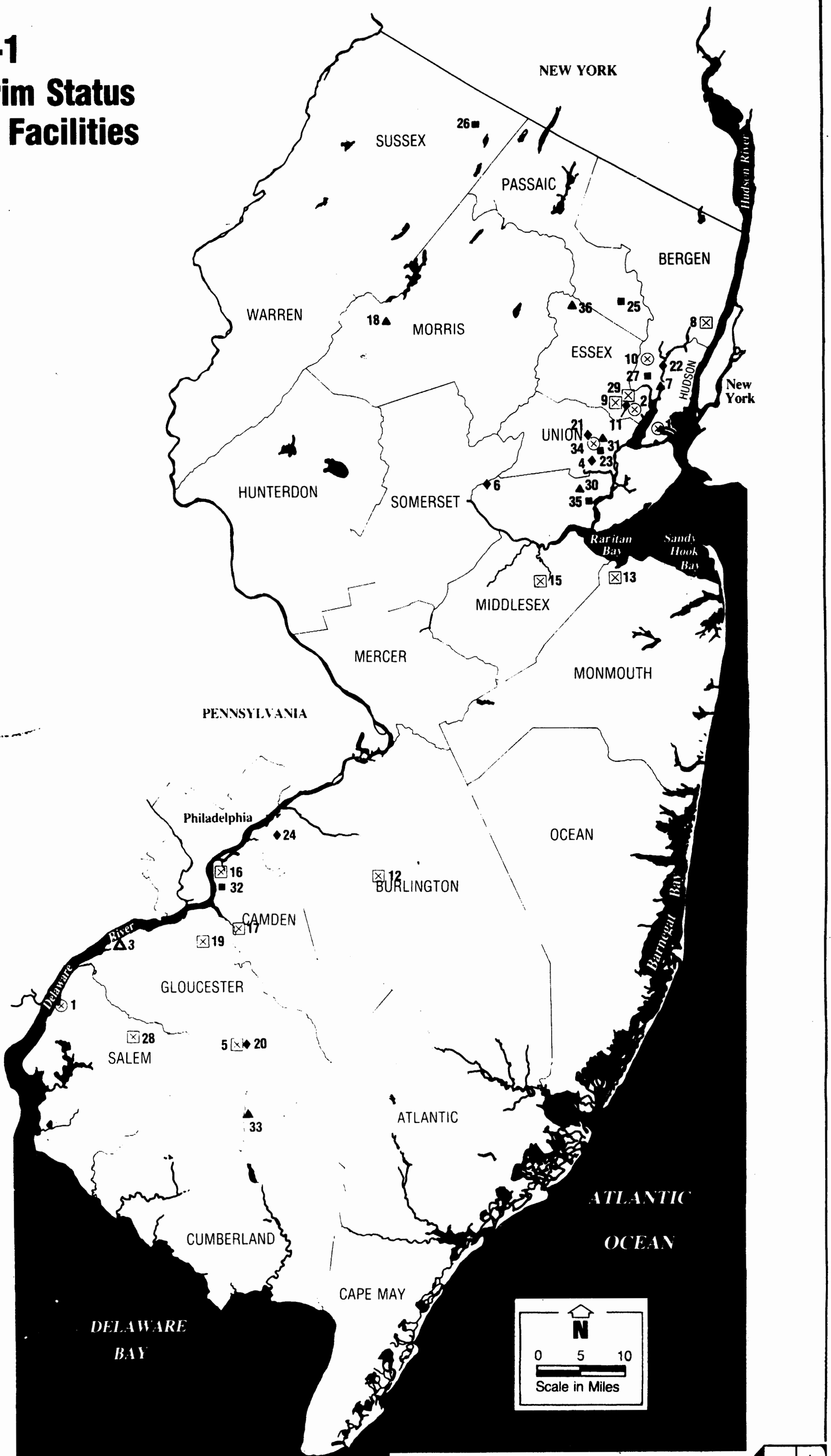
Figure 3-1
Commercial Interim Status Hazardous Waste Facilities

1. E.I. DuPont de Nemours & Co.
2. SCA Services
3. Rollins Environmental Services
4. Solvents Recovery Services
5. Oil Recovery Co.
6. Marisol, Inc.
7. S & W Waste
8. All County Environmental[2]
9. B & L Oil Corporation
10. Modern Transportation
11. McKesson Envirosystems
12. Noble Oil Co.
13. L & L Oil Services
14. Standard Tank Cleaning
15. Lionetti Waste Oil Service
16. Flowen Oil Co.
17. Pure Stream, Inc.
18. Advanced Environmental Technology Corporation
19. PITCCo.
20. Safety-Kleen Corp.
21. Perk Chemical Co.
22. Baron Blakeslee, Inc.
23. Reichhold Chemicals, Inc.
24. Detrex Chemical Industries
25. Pass Recovery Systems, Inc.
26. Emergency Technical Service
27. Cylinder Maintenance Corp.
28. C.R. Warner
29. BP North American Trading, Inc.[1]
30. McKesson Corporation[1]
31. Browning Ferris Industries[2]
32. Underwater Technics
33. Rezultz, Inc.[1]
34. Kit Enterprises[2]
35. C.P. Chemicals, Inc.
36. Phillip A. Hunt Chemical Corp.[1]

[1] Future Operations
[2] No Longer Accepting Hazardous Waste

Key to Facilities Treatment Processes:

- ⊗ Aqueous
- △ Incineration
- ⊠ Fuel Blending
- ◆ Solvent Recovery
- ▲ Transfer
- ■ Other



Note: Facilities are listed in descending order, by tons of waste treated in 1982.

Description of Individual Facilities[5]

Advanced Environmental Technology Corporation
Goldmine Road
Flanders, New Jersey 07836

AETC specializes in transfer and storage of a wide range of chemicals in small quantities such as laboratory chemicals or small quantity production chemicals. Much of AETC's work consists of consulting on hazardous waste handling procedures with the remainder being containerizing and removing waste to authorized treatment facilities. The company handles approximately 500 drums of waste per week.

All County Environmental Services Company
One River Road
Edgewater, New Jersey 07020

All County was a fuel blending facility, as well as hazardous waste transporter, dealing with bulk liquids only. The facility consists of two 150,000-gallon tanks where compatible wastes were mixed and stored, awaiting sale as blended fuels. This facility is currently closed by New Jersey DEP order.

B&L Oil Corporation
472 Frelinghuysen Avenue
Newark, New Jersey 07114

B&L produces an industrial grade fuel oil from waste lubricating oils. The company processes about 10,000 gallons per day of waste oil, recovering approximately ninety percent of that amount. Processes include settling to separate bottoms, sediment and water, addition of silicates to promote further settling, and addition of caustic as a cleaning and precipitating agent. Total tank storage volume at the facility is 385,500 gallons.

5 As of September 1984, selected revisions March 1985.

BP North American Trading, Inc.
Gilligan Street
Newark, New Jersey 07102

This is a new facility, affiliated with BP Chemical Company, which has not begun operation yet. The facility plans to process waste oils for use as a fuel constituent, mixing with virgin fuels to produce an industrial grade fuel. The facility's potential capacity is about three million gallons per year.

Baron Blakeslee, Inc.
49 Central Avenue
Kearny, New Jersey 07032

The Baron Blakeslee facility primarily is a distributor of virgin solvents. The solvent recovery operation is a secondary function which distills halogenated and non-halogenated waste solvents and still bottoms. The recovery facility has a potential capacity of approximately 24,000 tons per year but presently processes a small percent of that amount. The facility accepts drummed waste only and operates two batch stills and one fractionating column.

Browning-Ferris Industries, Inc.
714 Division Street
Elizabeth, New Jersey 07207

This is a transfer facility with no on-site treatment. It presently handles only municipal and industrial non-hazardous wastes. BFI formerly processed approximately fifty tons per day of hazardous oily sludge and chemical waste until it completed RCRA closure in December 1983.

C. P. Chemicals, Inc.
Arbor Street
Sewarsen, New Jersey 07077

C. P. Chemicals is a manufacturer of inorganic metallic salts which are used primarily by the plating industry. The company is presently utilizing spent nickel and copper solutions as part of its manufacturing feedstock under an Administrative Consent Order. In 1984, the facility accepted 3,350 tons of waste solutions which amounted to about twenty percent of the manufacturing process feedstock. This quantity is thought to be about eighty percent of the projected capacity in the next few years.

C. R. Warner, Inc.
East Lake Road, P. O. Box 134
Woodstown, New Jersey 08098

This oil recovery facility has very recently begun operation. The company accepts all types of waste oil including lubrication oils, fuel oils, quench oils, and metal working oils. The firm plans to process about 5.5 million gallons per year.

Cylinder Maintenance Corporation
590 Belleville Turnpike
Kearny, New Jersey 07032

This facility cleans out residuals from compressed gas cylinders which contain hazardous constituents. The facility handles approximately five tons per year of hazardous wastes. Residuals from the processes include a caustic scrubber wastewater sludge which is drummed and sent to a disposal facility.

Detrex Chemical Industries, Inc., Gold Shield Division
835 Industrial Highway, Unit No. 1
Cinnaminson, New Jersey 08077

Detrex is primarily a distributor of solvents, and operates this solvent recovery facility as a service to customers. The recovery facility is mainly used for recycling of waste trichloroethylene. No primary manufacturing takes place at this Detrex facility.

E. I. duPont de Nemours and Company
Chambers Works
Carneys Point Township
Deepwater, New Jersey 08023

duPont operates a forty million gallons per day wastewater treatment plant at its Chambers Works in Deepwater and utilizes a small percentage of this capacity to treat aqueous hazardous waste on a commercial basis. The treatment processes include neutralization, flocculation, sedimentation, and activated sludge treatment system using suspended activated carbon with a final clarification step. Primary settled solids are filter pressed and placed in a secure landfill on site. Solids from the activated sludge system are incinerated in a multiple hearth incinerator with heat recovery. Carbon is recovered from the incinerator ash. The facility does not accept drummed waste.

Emergency Technical Service Corporation
Mud Pound Road
Vernon Township, New Jersey 07836

ETSC is a specialty waste treatment firm which destroys only very reactive wastes such as explosives, shock-sensitive materials, and pyrophoric wastes. The firm handles an average of eighty pounds per day of reactive materials. Operations at this facility will cease in June as this facility does not represent the type of land use specified in the property deed.

Flowen Oil Delaware Valley, Inc.
1800 Carmen Street
Camden, New Jersey 08105

Flowen Oil reprocesses and blends about 30,000 gallons per day of waste lubricating oils to produce a commercial-grade fuel oil used in industrial boilers. The facility separates non-recoverable impurities by the following processes: sedimentation, heating, screening, and centrifugation. Impurities consist mostly of solids and water, and amount to about ten percent of the accepted waste oils. The final product is tested to assure sufficient quality for use as a boiler fuel.

Kit Enterprises
Elizabeth, New Jersey

Kit has been closed since 1982. Kit had the capacity to treat all types of oils including food processing wastes such as animal fats and oils as well as industrial lubricating oils and fuels. The facility also reported the capability to neutralize corrosive wastes, but very few details about any processes are available.

L&L Oil Service
740 Lloyd Road
Aberdeen, New Jersey 07747

L&L is a transfer and storage facility handling waste fuel oils, lubricating oils, and hydraulic oils. The facility heats the oil to vaporize some water and lower the viscosity to increase ease of handling. Some gravity settling occurs when the heated oil is stored in tanks awaiting transfer to a larger oil recovery facility. L&L has the capacity to handle 20,000 gallons per day.

Lionetti Waste Oil Service, Inc.
RD #1, Box 5A
Old Bridge, New Jersey 08857

This facility only transfers and stores waste automobile lubricating oil which they collect from service stations and automobile agencies. Some blending occurs inadvertently when waste oil is stored, awaiting transfer to an oil recovery facility. Lionetti has the potential capacity to handle 3,000 gallons per day of waste oil.

Marisol, Inc.
125 Factory Lane
Middlesex, New Jersey 08846

Marisol is a solvent recovery facility with a small fuel blending operation. The solvent reclamation operation includes three pot stills, one with a fractionating column. Most of Marisol's business consists of refining a high grade waste solvent to a quality which is adequate for thinning or cleaning purposes. The fuel blending operation consists of mixing solvent distillation bottoms with waste oils. The facility presently reclaims about five million gallons of waste solvent per year.

McKesson Envirosystems
600 Doremus Avenue
Newark, New Jersey 07102

This facility also recovers waste solvents and some solvents with an aqueous phase. The facility was purchased by McKesson from Inland Chemical Company late in 1981 and one year later suffered an explosion which virtually destroyed all the processing area. McKesson is seeking approval from New Jersey DEP to rebuild the facility and is planning on opening a solvent transfer station in Woodbridge, New Jersey. The Newark facility had the potential capacity to handle 4.8 million gallons per month of halogenated and non-halogenated solvents.

Modern Transportation, Inc.
75 Jacobus Avenue
Kearny, New Jersey 07032

Modern presently treats about 10,000 tons per year of aqueous wastes but has the capacity to treat at least 37,000 tons per year. The facility processes metal-bearing and corrosive wastewaters utilizing neutralization, gravity settling, and dewatering equipment. The plant also has transfer, storage, and some treatment capacity for oily wastes. Modern has also applied for permission to carry out more advanced wastewater treatment.

Noble Oil Company
Route 206 and Carner Road
Vincentown, New Jersey 08088

This facility is a transfer and storage facility for waste fuel oils, lubrication oils, and hydraulic oils. Noble handles approximately 10,000 gallons per day of waste oil.

Oil Recovery Company
Cenco Boulevard, P. O. Box 345
Clayton, New Jersey 08312

Oil Recovery treats waste oils, oil spill cleanup wastes, and oil tank cleanouts. Processing at the facility includes heating, screening, gravity separation, filtering, chemical flocculation, and fuel blending of many types of waste oils. Total capacity amounts to about sixty million gallons per year.

Pass Recovery Systems, Inc.
1500 Main Avenue
Clifton, New Jersey

Pass Recovery manufactures solder products from scrap lead and tin. The facility operates three 500-pound melting vessels and could potentially recover 300 tons per year.

Perk Chemical Company, Inc.
217 S. First Street
Elizabeth, New Jersey 07206

Perk Chemical does transfer, storage, recovery, and blending of waste solvents. The facility operates one batch still, a water separator, a mix tank, and also has a total drum storage capacity of approximately 250,000 gallons. The firm treats only non-flammable chlorinated solvents and acts only as a transfer station for flammable solvents.

Philip A. Hunt Chemical Corporation
3 Sperry Road
Fairfield, New Jersey 07006

This facility was recently permitted for storage and transfer operations only. The company's primary business is supplying ferric chloride and other etchants, and is now collecting drums of spent etchant as a source to its customers. Up to 96 drums can be stored at the facility where they are consolidated and hauled in bulk to a recovery or disposal facility.

Pricketts Industrial Tank Cleaning Corporation (PITCCO)
735 North Hurffville Road
Deptford, New Jersey 08096

PITCCO operates a tank cleaning service which removes oil residues from fuel oil tanks. The firm washes out tanks and returns the washout to its facility in tank trucks. The facility has eight tanks of various capacities totaling about 95,000 gallons, in which water is allowed to settle. The oil is then transported to an oil recovery facility.

Pure Stream, Inc.
P. O. Box 1240
Blackwood, New Jersey 08012

Pure Stream is an oil recovery facility which deals specifically with oil/water emulsions. The plant has an estimated potential capacity of 30,000 gallons per day and storage capacity of over 150,000 gallons. The processes include preheating, screening, plate separation, oil separation, and filtration. Pure Stream is unique in the fact that they will accept water to oil emulsion ratios up to 20:1.

Reichhold Chemicals, Inc.
726 Rockefeller Street
Elizabeth, New Jersey 07202

Reichhold Chemicals is a primary manufacturer of polyester and alkyd resins, and their plans to operate a non-commercial solvent recovery operation and incineration with heat recovery are presently being reviewed by the New Jersey DEP. The facility is petitioning New Jersey DEP to recover solvent to use in production and burn still bottoms in an incinerator to produce process steam.

Rezultz, Inc.
North Mill Road
Vineland, New Jersey 08360

Rezultz, Inc. is a proposed waste oil collection and transfer facility which has very recently received operating permits from the New Jersey DEP. Very little information is available on this facility at the time of this writing.

Rollins Environmental Services, Inc.
P. O. Box 221
Bridgeport, New Jersey 08014

Rollins has been operating a near full-service waste treatment facility at Bridgeport since 1969. Treatment processes used at the facility are rotary kiln incineration; aqueous treatment including neutralization, cyanide destruction, and chrome reduction; and biological treatment consisting of aeration, filtration, activated sludge treatment, carbon adsorption, and clarification. Rollins is no longer accepting any aqueous wastes but has continued operation of its incinerator. The 25,000 tons per year of incinerable wastes accepted utilizes about seventy percent of the available incineration capacity.

SCA Chemical Services, Earthline Division
100 Lister Avenue
Newark, New Jersey 07105

Earthline, a subsidiary of the major hazardous waste management company SCA Chemical Services, operates an integrated hazardous waste treatment facility which accepts a wide range of aqueous and organic wastes. Earthline has the process capability to do acid-base neutralization, waste detoxification (oxidation/reduction), decanting and dewatering, and fuel reclamation and blending, with potential treatment capacity totaling about 300,000 tons per year. SCA Chemical Services has recently been acquired by Waste Management, Inc.

S&W Waste, Inc.
225 Jacobus Avenue
South Kearny, New Jersey 07032

This facility is a transfer and storage operation handling a wide range of wastes. S&W accepts organic and aqueous liquids and sludges, in bulk or in drums. Much of the operation involves mixing liquid waste with absorbents to render them acceptable for landfilling. The plant presently handles about

10,000 tons of waste per year and is in the process of relocating to a new property very near to the present site. Operations at the new property should be of much greater efficiency and capacity.

Safety-Kleen Corporation
Box 215, Almo Industrial Park
Clayton, New Jersey 08312

Safety-Kleen's primary service is a parts-washing machine rental service. Maintenance shops rent the parts washers from Safety-Kleen and the company replaces the solvent periodically. Spent solvent is then collected and recovered at this facility. The company can potentially distill a combined total of more than 20,000 tons per year of mineral spirits and a chlorinated water-soluble solvent.

Solvents Recovery Services of New Jersey, Inc.
1200 Sylvan Street
Linden, New Jersey 07036

SRS recovers usable solvent products from waste solvents in three ways: (1) distillation of a waste solvent back to its original specifications for reuse by the waste generator (batch tolling), (2) restoration of a waste solvent to a usable quality, but not to its original purity, with the product sold to someone other than the generator, and (3) blending spent solvents of satisfactory quality with still bottoms to produce a commercial grade fuel, often used in cement kilns or incinerators. The equipment used in this processing includes distillation columns, fractionation towers, batch stills, thin film evaporators, and drying equipment for water removal. SRS treats approximately 0.5 to 1 million gallons per month, depending on waste solvent characteristics.

Standard Tank Cleaning
184 Hobart Avenue
Bayonne, New Jersey 07002

This facility cleans oil residues from tanks and barges, mostly for barges delivering oil to the nearby Exxon Refining. The company stores the tank washouts to allow the water to settle out, and then uses the waste oil to fuel the boilers used for steam cleaning.

Underwater Technics
2735 Buren Avenue
Camden, New Jersey

This firm specializes in hazardous materials cleanup. Much of the waste handled by Underwater Technics is oil spill cleanup wastes, but the firm also decants other oil/water wastes.

Compliance Status of Commercial Facilities

A comprehensive review of each commercial facility's regulatory compliance history was undertaken to determine the possibilities of untimely facility closure initiated either by: (1) the New Jersey DEP due to the severity and/or frequency of a facility's non-compliance violations, or (2) the facility itself due to the increases or expected increases in direct/indirect operating costs generated by attempts to comply with new regulations.

The consultant examined enforcement records and other facility files at the New Jersey DEP's Office of Regulatory Services (legal enforcement) as well as the Divisions of Waste Management, Water Resources, and the Bureau of Air Pollution Control. The files included:

1. Notices of prosecution and violation
2. Administrative Consent Orders
3. RCRA inspection reports
4. Pollution incident reports
5. New Jersey DEP/facility correspondence

Key enforcement persons for each facility were interviewed, including enforcement attorneys, Bureau engineers, New Jersey DEP administrators, and field inspectors. Information was obtained on the nature and relative importance of hazardous waste activities at the site, the justification for New Jersey DEP's jurisdiction, the quality of the facility's compliance efforts, and the facility's understanding of its regulated status.

Table 3-4 summarizes the compliance review. The process by which these results were synthesized from New Jersey DEP files and discussions with its personnel was facility-specific. All available information was evaluated against the following criteria:

1. the type and size of facility operations,

TABLE 3-4

NEW JERSEY COMMERCIAL HAZARDOUS WASTE FACILITIES
COMPLIANCE EVALUATION SUMMARY

	Likely to Continue Operating	Closed Unlikely to Reopen	Closed Likely to Reopen	Other
Advanced Environmental Technology	X			
All-County Environmental Services		X		
B&L Oil Corporation	X			
BP North American				X[1]
Baron Blakeslee	X			
Browning-Ferris Industries		X[2]		
C. P. Chemicals Corporation				X[1]
C. R. Warner, Inc.				X[1]
Cylinder Maintenance	X			
Detrex Chemical-Gold Shield Division	X			
E. I. duPont de Nemours	X			
Earthline-SCA Chemical				X[3]
Emergency Technical Services				X[4]
Flowen Oil Delaware Valley	X			
Kit Enterprises		X		
L&L Oil Service, Inc.	X			
Lionetti Waste Oil	X			
Marisol, Inc.	X			
McKesson Corporation (transfer)				X[1]
McKesson Envirosystems (solvent recovery)			X	
Modern Transportation	X			
Noble Oil Company				X[5]
Oil Recovery Company, Inc.				X[5]
Pass Recovery Systems, Inc.	X			
Perk Chemical Company	X			
Philip A. Hunt Chemical				X[1]
PITCCO	X			
Pure Stream, Inc.	X			
Reichhold Chemicals, Inc.	X			
Rezultz, Inc.	X			
Rollins Environmental Services, Inc.	X			
S&W Waste, Inc.	X			
Safety-Kleen Corporation	X			
Solvents Recovery Services	X			
Standard Tank Cleaning Corporation	X			
Underwater Technics, Inc.	X			

TABLE 3-4 (continued)

Footnotes:

1. New or proposed facility.

2. Closure at Browning-Ferris completed on 12 December 1983. Commercial non-hazardous waste activities continue.

3. Situation uncertain. SCA's compliance records are currently the subject of legal review.

4. Closure expected in June.

5. Situation uncertain. This facility is currently an enforcement case with New Jersey DEP.

2. the circumstances surrounding the violations and the enforcement officer's justification for the penalty assessed or action recommended,

3. amount of guidance available to the facility from New Jersey DEP, and

4. the nature and outcome of a facility's challenge of New Jersey DEP's authority to regulate it.

The facilities likely to continue operating are those whose history reflects improved compliance over time and a fundamental understanding that, in the hazardous waste management business, regulatory compliance and good faith interaction with the state are basic tenets of good business practice.

New Jersey has already promulgated state standards for the types of facilities currently operating in the state. Hence, wholesale revisions to the regulatory program are unlikely. However, in this field of rapidly emerging technology and escalating governmental scrutiny, regulatory changes at the state and federal level are inevitable.

IMPORT AND EXPORT OF MANIFESTED WASTE TO AND FROM NEW JERSEY

The hazardous waste management industry operates as an interstate business with substantial transportation of waste across state boundaries. In fact, many commercial facilities assert that to be financially viable, they must serve a multistate area.

The movement of waste to and from New Jersey certainly reflects this as shown below:

Year	Waste Manifested by New Jersey Generators to Facilities in Other States (percent of total waste manifested)	Waste Manifested by by Out-of-State Generators to Facilities in New Jersey (percent of total waste received by facility)
1981	44%	45%
1982	46%	41%
1983	45%	40%

New Jersey was a net exporter of waste, exporting about 225,000 tons in 1983 versus imports of 166,000 tons.

Imported Wastes

Table 3-5 shows the manifested waste received by thirty New Jersey commercial facilities. The table is organized as to location of generator:

- Six states in New Jersey's region (Connecticut, Delaware, Maryland, New York, Pennsylvania, and Virginia)
- New England states other than Connecticut
- Other states as a whole
- New Jersey

Largest Sources of Imported Waste

Pennsylvania generators account for more waste imports than any other state. The amount received from Pennsylvania declined by 44 percent from 1981 to 1982, mostly due to substantial decreases in aqueous wastes. However, in 1983 the amounts increased sharply, nearly returning to 1981 levels. New York generators ranked second each year among the sources of imported waste. The quantity of waste received from New York and Pennsylvania collectively accounted for over fifty percent of all imports in each of 1981, 1982, and 1983.

Facilities Importing Relatively Large Amounts of Waste

Only eight New Jersey facilities received less waste from New Jersey industries than from out-of-state industries for two or more years from 1981 through 1983. Three of these facilities are rather small, receiving no more than 500 tons in any year, and a fourth is temporarily closed. The remaining four are larger facilities: SCA, Safety-Kleen, Rollins, and Noble Oil.

Incineration. Rollins, in both 1981 and 1982, received three times more waste from generators located outside New Jersey than from those in New Jersey. In 1983, imports to Rollins declined while wastes from New Jersey generators increased; still, imports exceeded New Jersey wastes. There is no geographic pattern in these imports other than slightly more coming from New York and New England than from Pennsylvania

TABLE 3-5

MANIFESTED WASTE RECEIVED BY NEW JERSEY COMMERCIAL FACILITIES
FROM VARIOUS STATES IN 1981, 1982, AND 1983[1]
(tons per year)

Commercial Facility - TSDF	Connecticut	Delaware	Maryland	New York	Pennsylvania	Virginia	Other New England States	Other States	Total Out-of-State	New Jersey	Predominant Wastes
Advanced Environmental	34	208	1	240	256	0	1	0	740	1,444	Aqueous and
Technology Corporation	15	83	24	303	278	2	0	30	735	1,018	organic liquids
	39	85	68	422	327	0	0	4	945	1,355	
All County Environmental	229	0	25	678	2,813	0	411	25	4,181	7,614	Oils and
Services Company	189	0	176	977	2,179	0	150	0	3,671	6,502	non-halogenated
	49	0	752	629	824	0	886	0	3,140	4,660	solvents
B&L Oil Corporation				78	1,148				1,226	10,534	Oils
				1,391	0				1,391	8,526	
				1,281	0				1,281	13,619	
Baron Blakeslee, Inc.			3	225	96			3	327	264	TCE and
			2	82	82			0	166	139	other solvents
			6	171	61			3	241	259	
Browning-Ferris Industries				1,833	2				1,835	2,629	Chemical process
				0	0				0	769	solids and sludges
				0	0				0	0	
Cylinder Maintenance			0		0				0	0	Hazardous gases
Corporation			1		0				1	4	
			1		170				171	29	
Detrex Chemical Industries				0	21				23	69	TCE
				21	12				33	127	
				6	11				17	183	

[1] 1981 figures listed first, 1982 second, and 1983 third.

TABLE 3-5 (continued)

Commercial Facility - TSDF	Connecticut	Delaware	Maryland	New York	Pennsylvania	Virginia	Other New England States	Other States	Total Out-of-State	New Jersey	Predominant Wastes
E. I. duPont de Nemours	4,369	9,833	7,415	1,131	31,234	4,324	5,223	4,821	68,350	89,407	Aqueous wastes
and Company	1,533	2,823	7,939	1,450	15,073	2,509	2,550	6,412	40,289	58,611	
	4,399	5,664	4,833	2,904	34,960	2,621	2,197	2,352	59,930	95,070	
Emergency Technical		1		2	2		1		6	21	Explosives,
Services Corporation		0		1	1		2		4	8	pyrophoric, and
		0		1	3		1		5	18	shock-sensitive wastes
Flowen Oil Delaware				0	0				0	0	Oils
Valley, Inc.				37	544				581	1,889	
				10	715				725	8,675	
Kit Enterprises	11,152			1,589	1,195		107		14,043	16,234	Food processing
	721			216	73		0		1,010	2,382	wastes and oils
	0			0	0		0		0	0	
L&L Oil Service, Inc.									0	7,542	Oils
									0	8,906	
									0	10,084	
Lionetti Waste				0	0				0	7,951	Oils
Oil Service, Inc.				0	1				1	6,844	
				1,339	2,795				4,134	9,366	
Marisol, Inc.	570	115	339	5,796	2,212	857	589	39	10,517	8,292	All solvents
	99	58	639	1,362	1,529	739	1,386	52	5,864	8,204	
	139	28	509	1,159	924	719	780	193	4,451	8,849	
McKesson Envirosystems	42	0	26	14,663	915		3,800	2,251	21,697	2,909	All solvents
	203	9	0	2,846	571		2,040	796	6,465	3,043	
	0	0	0	0	0		0	0	0	0	

TABLE 3-5 (continued)

Commercial Facility - TSDF	Connecticut	Delaware	Maryland	New York	Pennsylvania	Virginia	Other New England States	Other States	Total Out-of-State	New Jersey	Predominant Wastes
Modern Transportation	1,312	985		7,347	3,498		565		13,707	29,301	Aqueous wastes
	20	167		1,854	1,404		0		3,445	6,287	and some oils
	0	0		627	67		0		694	806	
Noble Oil Company		0	0	51	0				51	55	Oils
		0	169	2,239	2,638				5,046	4,035	
		669	187	4,859	4,172				9,887	7,113	
Oil Recovery Company, Inc.	0	656	2,847	962	3,237	0	60		7,762	8,255	Oils
	310	465	2,659	529	3,761	115	0		7,839	11,421	
	42	859	1,591	85	3,065	621	0		6,263	6,537	
Pass Recovery Systems, Inc.					0			0	0	6	Solid lead scrap
					16			0	16	56	
					21			219	240	60	
Perk Chemical Company, Inc.	0			121	70		26	24	241	578	All solvents
	39			83	0		6	0	128	418	
	48			129	3		59	3	242	458	
Pricketts Industrial Tank Cleaning Company (PITCCO)		5			47				52	1,173	Fuel oil emulsions
		19			51				70	1,357	
		8			4				12	1,388	
Pure Stream, Inc.				272	636				908	1,667	Oil emulsions oils
				81	526				607	1,289	
				0	2,659				2,659	1,341	
Reichhold Chemicals, Inc.			0		263				263	133	Non-halogenated solvents
			99		119				218	59	
			0		0				0	0	

TABLE 3-5 (continued)

Commercial Facility - TSDF	Connecticut	Delaware	Maryland	New York	Pennsylvania	Virginia	Other New England States	Other States	Total Out-of-State	New Jersey	Predominant Wastes
Rollins Environmental Services, Inc.	1,781	823	516	7,847	3,376	2,214	2,413	2,119	21,089	5,550	All types of combustible wastes
	1,258	1,056	153	6,793	1,441	6,868	1,229	3,035	20,833	6,098	
	1,375	272	264	3,586	1,893	1,919	1,408	2,528	13,245	9,055	
S&W Waste, Inc.	8			1,012	223		64	155	1,462	9,748	Aqueous wastes, sludges, solids, oils, non-halogenated solvents
	8			542	240		63	0	853	9,754	
	37			1,009	311		88	39	1,484	19,116	
SCA Chemical Services	10,269	389	1,422	9,353	8,633	0	4,663	899	35,628	29,971	Aqueous wastes, non-halogenated solvents, oil
	4,167	44	1,786	8,604	2,788	11	4,617	78	22,095	21,544	
	4,951	0	4,202	12,181	1,098	12	5,693	804	28,941	21,859	
Safety-Kleen Corporation	0		0	0	0	0	0	0	0	0	Proprietary solvent cleaners
	188		148	328	253	76	129	185	1,307	28	
	928		2,539	4,258	3,264	1,489	2,933	1,938	17,349	951	
Solvents Recovery Services of New Jersey, Inc.	4,063	355	0	1,535	2,638	709	130	194	9,430	13,646	All solvents
	1,688	506	20	2,414	1,533	2,050	34	0	8,245	11,417	
	2,712	282	76	2,100	2,502	2,256	24	9	9,961	13,239	
Standard Tank Cleaning				35	0				35	6,947	Oils and oil emulsions
				50	13				63	8,332	
				68	0				68	11,732	
Underwater Technics					0				0	5	Oils, process chemicals
					91				91	508	
					161				161	39	
TOTALS 1981 (rounded)	34,000	13,000	13,000	55,000	63,000	8,000	18,000	10,000	214,000	262,000	
1982 (rounded)	10,000	5,000	14,000	32,000	35,000	11,000	12,000	11,000	131,000	190,000	
1983 (rounded)	15,000	8,000	15,000	37,000	60,000	10,000	14,000	8,000	166,000	246,000	

and mid-Atlantic states. This reflects the fact that the Rollins service of incinerating non-liquid waste is not duplicated elsewhere in the East.

Aqueous Treatment. The SCA and duPont facilities specialize in aqueous waste treatment, and both received large amounts from out-of-state generators. In fact, aqueous wastes appear to account for about fifty percent of the waste imported to New Jersey from 1981 to 1983. SCA received most of its imports from New York and New England, while duPont's imports came mostly from Pennsylvania, Maryland, Delaware, and Virginia. This shows the significance of transportation costs in relationship to the typically low prices charged for aqueous waste treatment and the location of SCA in Newark and duPont in Deepwater. Chapter Five will analyze the significance of transportation in more detail.

Solvent Recovery. The large solvent recovery facilities (e.g., Marisol and SRS) received large amounts of wastes from generators in other states, as did Safety-Kleen, the parts-washing machine rental company. Although Maryland, New York, and Connecticut have solvent recovery facilities, the large amount of waste shipped to New Jersey facilities indicates the cost-effectiveness of some out-of-state generators using facilities in New Jersey.

Oil Recovery. It is evident from Table 3-5 that New Jersey's treatment capacity is well-developed in oil recovery as well as solvent recovery. Oil recovery facilities collectively imported a large amount of waste oils but not as much as received from New Jersey generators.

Exported Wastes

Table 3-6 lists exported waste quantities by state of destination. This information was compiled using the most recent manifest files for 1981, 1982, and 1983. Table 3-6 also shows the predominant method used by the receiving facilities to treat or dispose of the New Jersey waste. This analysis is based on the consultant's understanding of the treatment operations conducted at the many facilities in these states.

Exports to Pennsylvania

An overwhelming majority of wastes exported were sent to Pennsylvania. Most of these wastes were aqueous waste for which there exists a large treatment capacity in Pennsylvania

TABLE 3-6

QUANTITY OF WASTE MANIFESTED FROM NEW JERSEY GENERATORS TO FACILITIES IN OTHER STATES
(tons)

	1981	1982	1983	Predominant Management Method
Alabama	12,365	6,460	3,280	Landfill
Arkansas	690	813	337	Incineration
California	584	146	0	Incineration
Connecticut	2,424	2,722	2,579	Solvent recovery, aqueous treatment
Delaware	307	429	314	Stabilization
Georgia	0	426	0	Incineration, aqueous treatment
Idaho	0	205	125	Landfill
Illinois	0	0	1,812	Incineration
Indiana	996	50	2,751	Incineration unknown
Kentucky	2,213	616	2,199	Solvent recovery
Louisiana	186	181	430	Incineration, landfill
Massachusetts	198	505	783	Solvent recovery
Maryland	41,769	33,168	22,379	Landfill (now closed), aqueous treatment, oil recovery, solvent recovery
Michigan	16	315	2,324	Solvent recovery, oil recovery
Minnesota	590	1,145	479	Incinerator (captive)
Missouri	54	108	0	Landfill
North Carolina	409	26	954	Aqueous treatment, energy recovery
New Hampshire	14	4	5	Incineration
New York	43,368	36,540	41,669	Landfill, aqueous treatment, energy recovery, oil recovery

TABLE 3-6 (continued)

	1981	1982	1983	Predominant Management Method
Ohio	9,558	14,785	38,581	Landfill, landfarm, aqueous treatment
Oklahoma	331	333	2,368	Deep well injection
Pennsylvania	118,029	101,368	97,331	Aqueous treatment, landfill, oil recovery, energy recovery
Rhode Island	127	752	447	Aqueous treatment
South Carolina	6,463	3,749	2,258	Solvent recovery, landfill
Tennessee	217	1	20	Energy recovery
Texas	347	1,502	163	Deep well injection, incineration
Virginia	7,102	4,439	5,194	Energy recovery
West Virginia	60	44	0	Solvent recovery
Wisconsin	0	0	1	Landfill
United States Export	1,197	1,097	497	
TOTALS (rounded)	250,000	212,000	225,000	

(three large treatment facilities are located in the Philadelphia region). In addition to aqueous wastes, Pennsylvania facilities also accepted a significant portion of wastes for landfill disposal. Nevertheless, both of the two landfills in eastern Pennsylvania have closed.

Other Predominant States

Other predominant destination states include in ranked order: New York, Ohio, Maryland, and Alabama. All of these states have substantial landfill capacity, a disposal method which is lacking in New Jersey, and landfilling the predominant management method in each case. The landfill facility in Maryland closed at the start of 1983, and the significance of this state as a destination of New Jersey waste diminished somewhat.

Predominant Receiving Facilities

Waste Conversion, Inc. is the largest out-of-state receiving facility for New Jersey wastes, treating 21,700 tons of New Jersey waste in 1983. The plant, located in Lansdale, thirty miles north of Philadelphia, is primarily an aqueous treatment facility but also does some oil recovery and accepts a wide range of wastes mostly in liquid or sludge form.

Chem-Clear, Inc. operates aqueous treatment facilities located in Chester, Pennsylvania and Baltimore, Maryland. Chem-Clear also does a small amount of oil recovery and accepts bulk or containerized liquids or solids. In 1983, the Baltimore plant treated 9,300 tons and the Chester facility treated 19,500 tons of New Jersey wastes.

CECOS International, Located in Niagara Falls, New York, operates a secure landfill facility with some aqueous treatment on site. CECOS has plans to install a supercritical water thermal oxidizer. In 1983, the firm disposed of 19,000 tons of New Jersey waste. CECOS also operates a landfill in Cincinnati, Ohio which accepts a substantial amount of New Jersey wastes.

Fondessy Enterprises, Inc. operates a landfill located in Oregon, Ohio. Processes at the facility, which accepted about 17,400 tons of New Jersey's landfillable wastes in 1983, include stabilization, land treatment, and landfill.

Conversion Systems, Inc. specializes in a proprietary stabilization process using fly ash. Their stabilization facility treated 15,600 tons of New Jersey wastes in 1983 and is located in Marcus Hook, Pennsylvania.

Keystone Portland Cement Company burns hazardous combustible materials as auxiliary fuels for its two cement kilns at its cement production facility just north of Bethlehem, Pennsylvania. Keystone burned about 12,400 tons of auxiliary waste fuels from New Jersey in 1983.

American Recovery operates an aqueous treatment facility in Baltimore, Maryland and an oil recovery facility in Sparrows Point, Maryland. The Baltimore facility has the capacity for many aqueous processes and accepts bulk and containerized liquids and solids. The Sparrows Point facility treats all types of waste oil and sells the product as fuel oil. Both facilities combined to treat 12,000 tons of New Jersey waste in 1983.

SCA Services operates a secure landfill and aqueous treatment facility in Model City, New York. This facility, which accepted 9,500 tons of New Jersey waste in 1983, has a wide range of aqueous treatment capabilities.

Delaware Container, located in Coatesville, Pennsylvania, treated about 7,300 tons of New Jersey waste in 1983. The facility is primarily a transfer and storage operation but also does limited amounts of neutralization, thickening, and solidification.

Evergreen Landfill disposed of 6,500 tons of New Jersey waste in 1983. The facility, located in Northwood, Ohio, does no on-site waste processing other than secure landfill disposal.

Chemical Waste Management runs a large secure landfill in Emelle, Alabama with some other on-site treatment capabilities. The amount of waste manifested by New Jersey generators to their facility has declined from over 12,000 tons in 1981 to about 3,000 tons in 1983. The facility is recognized by many to be the dominant landfill in the eastern United States; this prominence is documented by the fact that during a six-month period in 1981, the facilty received wastes from 39 states at an annual rate of 250,000 tons.

Management Methods for Exported Wastes

For 1983, manifested wastes were totaled by the different recovery, treatment, and disposal methods used by the receiving facilities. These computations considered the type of waste and the predominant management methods used by the facility.

Table 3-7 shows the recovery, treatment, and disposal methods employed for New Jersey wastes. The table is split to distinguish between wastes managed by New Jersey facilities and wastes manifested to facilities in other states. Figure 3-2 depicts the information graphically.

This information may have some minor discrepancies from actual methods. Sometimes, it was difficult to determine how wastes were managed at facilities which operate several treatment methods. Such facilities include SCA Services in New York, Browning-Ferris Industries in Maryland, and CECOS International in New York. Also, it was often difficult to determine treatment methods at many of the more obscure facilities. In this case, the waste quantity was assigned to the unknown category. Also, it should be noted that the total amount of New Jersey waste sent to New Jersey facilities given in Table 3-6 does not match the corresponding number from Table 3-3. This is due to the fact that Table 3-7 includes wastes sent to facilities in New Jersey which are not officially authorized by the New Jersey DEP.

As shown in Table 3-7, the two waste treatability types most heavily exported (as a percentage of the quantity of that waste type generated) are landfillable wastes and wastes for energy recovery. The obvious reason for the 100 percent export of landfillable wastes is that there exists no commercial landfill in New Jersey. About 28,000 tons per year of New Jersey's wastes are exported and burned as supplemental fuels at cement kilns (again, a facility lacking in New Jersey).

New Jersey has substantial capacity in oil recovery, solvent recovery, and aqueous treatment; yet, twenty to thirty percent of these types of wastes generated within New Jersey are sent to out-of-state facilities. In contrast, Table 3-5 indicates that oil and solvent recovery and aqueous treatment facilities do treat significant quantities of imported wastes. This situation is probably due to natural market forces of varied pricing and transportation costs.

TABLE 3-7

MANAGEMENT METHODS FOR NEW JERSEY WASTE
(for 1983 in thousands of tons)

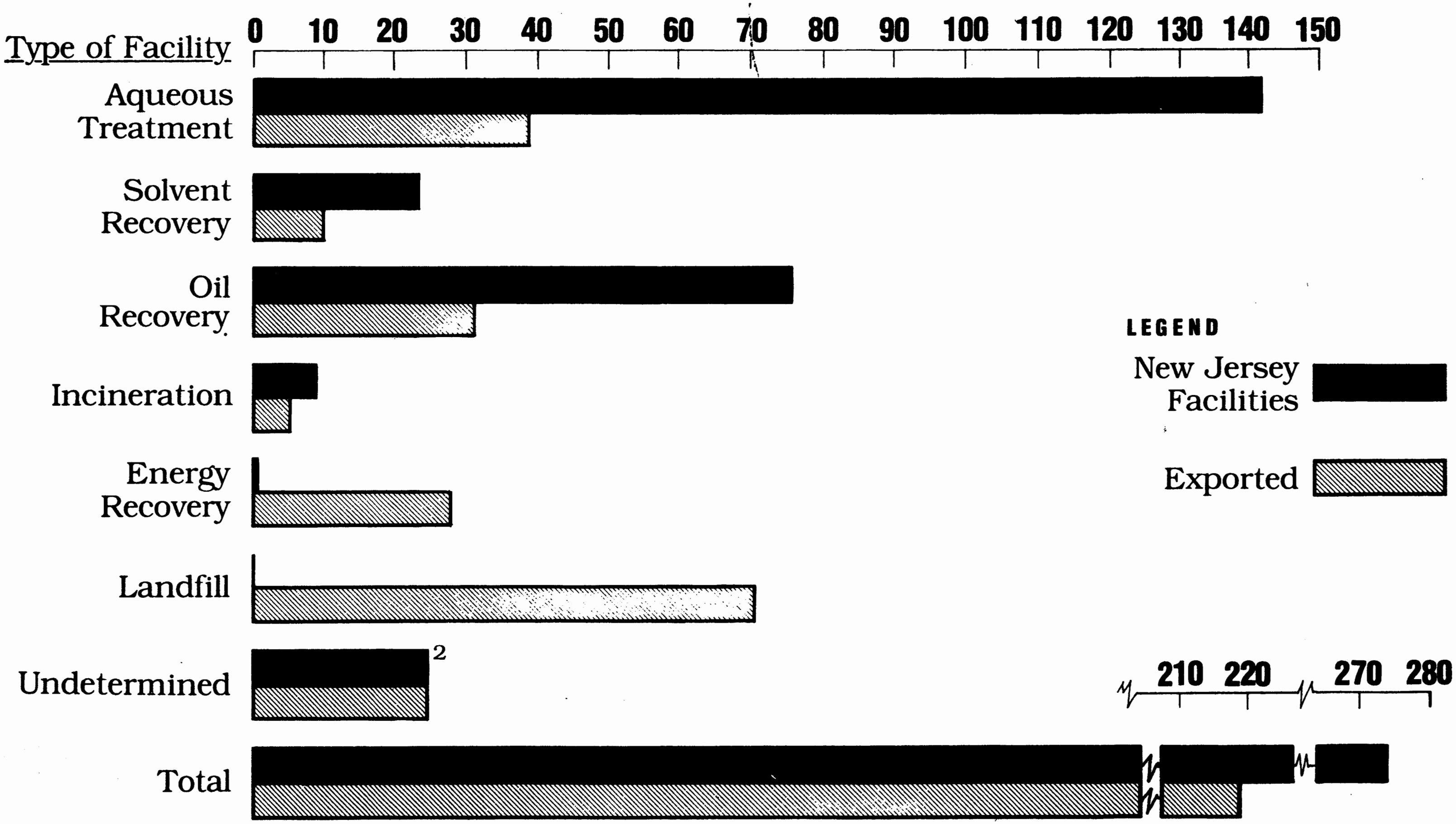
Manifested to New Jersey Facilities

	Aqueous Treatment	Solvent Recovery	Oil Recovery	Incineration	Energy Recovery	Unknown	Other	Totals
Aqueous Liquids	141					3	12	156
Organic Liquids		23	5	9		3		40
Oils			63		1	1		65
Inorganic Sludges/Solids							4	4
Organic Sludges/Solids			6				1	7
Column Totals	141	23	74	9	1	7	17	272
Unexamined								1
								273

Manifested to Out-of-State Facilities

	Aqueous Treatment	Solvent Recovery	Metals Recovery	Oil Recovery	Incineration	Energy Recovery	Landfill	Other	Unknown	Totals	Total Manifested
Aqueous Liquids	39							6	2	47	203
Organic Liquids		10		3	5	27		7	4	56	96
Oils				28		1		1	1	31	96
Inorganic Sludges/Solids			6				48	3	3	60	64
Organic Sludges/Solids							23	1		24	31
Column Totals	39	10	6	31	5	28	71	18	10	218	
Unexamined										1	2
										219	492

Figure 3-2
New Jersey Wastes Manifested To New Jersey And Out-of-State Facilities[1] (For 1983 in Thousands of Tons)



[1]Based on predominant treatment and disposal methods of facilities
[2]Mostly storage/transfer facilities

CHAPTER FOUR

POTENTIAL FUTURE SOURCES OF MANIFESTED WASTE

OBJECTIVE

The objective of Chapter Four of the Facilities Plan is three-fold:

1. To forecast quantities for wastes not currently manifested but which in the future will represent additional demand for commercial facilities. Four sources of future manifested wastes include:

   a. wastes generated as a result of cleanup activities at inactive disposal sites,

   b. wastes shifted to commercial facilities due to closure of on-site facilities,

   c. waste shifted to commercial facilities due to more stringent regulation of wastes and waste-derived fuels burned in boilers, and

   d. wastes generated from implementation of industrial wastewater treatment and pretreatment regulations.

2. To estimate the quantity of hazardous waste generated in New Jersey that is managed on site in RCRA-regulated facilities.

3. To survey other states to obtain information on pending regulations and commercial facility proposals/closures that may affect waste quantities imported into New Jersey.

WASTES GENERATED FROM SITE CLEANUPS

New Jersey DEP's Cleanup Plan

New Jersey DEP developed the "Management Plan for Remedial Actions" (the Cleanup Plan) to provide a systematic approach to remedial actions and to coordinate cleanup and enforcement actions at hazardous waste sites. Several site cleanups in this Plan are scheduled for implementation in the 1984 through 1988 time frame.

To date, 148 sites have been scored (preliminarily investigated and negotiations for cleanups under way). Twelve additional sites are waiting to be scored. Remedial action is in progress at many sites, but most sites are in the various stages of more thorough investigation and planning. The nature and scope of cleanup activities have been very well defined for some sites. At other sites, though, virtually nothing is known except that a potential hazard exists. At this stage in the Cleanup Plan's implementation, definitive information about the quantity and types of waste to be generated from all sites is incomplete.

Generalizations About Remedial Actions

Remedial action at an uncontrolled hazardous waste site can take many forms. The action depends upon the size and scope of the original waste handling operations, the type of waste present, and a variety of site-specific factors. The remedial action program for a specific site may or may not require that wastes be removed from the site and separately disposed of at a commercial hazardous waste facility.

Often, it is neither technically nor economically feasible to remove waste from a site. And in some cases, a greater hazard can be created by disturbing long-buried waste than by leaving it in place. For example, it is usually not feasible to completely remove hazardous wastes from municipal landfills because much of the waste is often thinly dispersed throughout a massive amount of municipal refuse. In such circumstances, remedial action can consist of either isolating, immobilizing, or stabilizing the waste in place by a variety of methods.

A variety of considerations impact the decision to remove waste from a site or to leave it in place, not the least of which are cost and availability of off-site disposal facilities. However, the following generalizations can be made based on experience to date in New Jersey:

- Large bodies of aqueous waste, such as those found in lagoons or impoundments, are best treated on site using a portable wastewater treatment system whenever possible. However, the bottom sludge remaining in lagoons or impoundments often must be removed for off-site disposal if the bottom of the lagoon is below or very close to the water table.

- Aqueous streams generated during tank closures, tank cleaning, decontamination procedures, and test pumping of contaminated ground water at cleanup sites are usually sent for off-site management.

- Bulk waste oils, common in tanks or impoundments, are usually removed and disposed of off site, often via incineration.

- Drummed wastes will usually be removed relatively quickly and be disposed of off site, with the disposal method used depending upon the type of waste.

- Contaminated soil often covers a large area and represents an enormous volume of waste which can be prohibitively expensive to remove and dispose of off site. New Jersey DEP currently advocates removal and off-site disposal. As the extent of the problem in New Jersey becomes better defined, though, more extensive use of encapsulation on site may occur.

- Other contaminated materials, such as protective clothing, generated by the conduct of site cleanup operation, are usually drummed and managed off site.

Quantity of Waste Generated by the Cleanup Plan

The consultant reviewed specific information with site managers from New Jersey DEP's Hazardous Site Mitigation Administration for 120 sites in the Cleanup Plan. More general information was obtained on the forty additional active sites from a Division Chief of the Hazardous Site Mitigation Administration . Using the information available and the previously discussed generalizations regarding on-site versus off-site disposal, the consultant projected that 97 of the sites in the Cleanup Plan might generate wastes for off-site disposal (see Table 4-1).

Remedial action plans have not yet been completed for all of the sites and many sites have not yet been fully investigated. However, the consultant has been able to draw the following conclusions from its investigations:

1. For the most part, the sites containing tens of thousands of removable drums (e.g., Chemical Control in Elizabeth, New Jersey) have already been identified and largely cleaned up.

2. While many sites containing removable drums still remain, they appear to mostly contain hundreds rather than thousands of drums. Based on the site descriptions in the Cleanup Plan, it appears unlikely that more than 4,000 to 8,000 drums per year (roughly equivalent to 1,000 to 2,000 tons per year) will be removed from the designated sites and disposed of off site during the 1984 to 1988 time frame.

3. By far, the largest quantity of waste having a reasonable potential for off-site disposal will be sludges and residues removed from lagoons and impoundments. It may be expected that these wastes will contain a variety of heavy metals, organics, and oily solids and sludges. The quantity available for off-site disposal will depend on the specifics of the remedial action plans still being developed.

Examples of Cleanup Actions

The largest lagoon in the Cleanup Plan is at the Bridgeport Rental and Oil Services site in Logan Township, Gloucester County. This 11.5-acre lagoon contains a floating layer of PCB-contaminated oil at the top and oily sludges at the bottom. Based on very rough estimates, the lagoon contains almost 300,000 tons of contaminated wastewater, 10,000 tons of oil, and 50,000 tons of bottom sludge. The option of on-site treatment is being considered: the wastewater via a portable treatment system and the oil and the sludge via incineration. However, this site illustrates the large quantity of waste involved in a lagoon cleanup, which if not managed on site would represent substantial new demand for commercial facilities.

TABLE 4-1

PROJECTED NUMBER OF SITES IN NEW JERSEY DEP
CLEANUP PLAN THAT MIGHT GENERATE
WASTE FOR OFF-SITE DISPOSAL

Year[1]	Sites To Be Cleaned Up	Sites That Might Generate Wastes For Off-Site Disposal
1984	18	9
1985	36	27
1986	21	15
1987	30	15
1988	30	15
Unscheduled[2]	31	20
TOTAL	141[3]	97

[1] Cleanup will start in the indicated year but will not necessarily be completed in that year. If a site cleanup included treatment of ground water, this operation may take several years to complete.

[2] Unscheduled sites are those already identified. Hazardous Site Mitigation estimates that construction projects will occur at about thirty sites for a number of years past 1988 as all existing sites are remediated.

[3] Numbers do not include sites at which cleanup is complete, no cleanup is required, or which involve radioactive wastes.

Another example is the Burnt Fly Bog Site in Monmouth and Middlesex Counties. This site may be expected to generate over 20,000 tons of organic liquids, tars, and other residues over a period of several years according to New Jersey DEP estimates. While most other sites will not be as large, even the cleanup of a relatively small lagoon can generate a very large quantity of waste (e.g., a one-foot thick layer of sludge removed from a one-acre lagoon amounts to approximately 1,500 tons).

At other large sites, such as the Lipari Landfill, CPS/Madison, and the Lone Pine Landfill, the option of on-site control is being considered.

Another source of wastes for off-site disposal is intermittent aqueous wastes generated during the course of cleanup operations. The quantity of this waste can often be quite significant. For example, in setting up site monitoring wells, a 48-hour pump test at 100 gallons per minute will generate 1,200 tons of aqueous waste. Identified sources of nearly 10,000 tons of bulk aqueous wastes for off-site disposal include Burnt Fly Bog, Quanta Resources Corporation, and Renora Incorporated.

Identification of Additional Sites

It should be noted that the New Jersey DEP reports a backlog of about 1,000 sites requiring initial investigations. Many more sites reported as incidents will also be investigated. However, none of these sites will generate large quantities of wastes during the time frame of this Facilities Plan due to the timelines involved in investigation and planning.

Environmental Cleanup Responsibility Act

The Environmental Cleanup Responsibility Act (ECRA, NJSA 13:1K-6, et seq.) will result in additional cleanup waste for off-site disposal. ECRA establishes the procedures to be followed by industrial establishments to insure adequate preparation and implementation of acceptable cleanup procedures as a precondition of any closure, sale, or transfer of an industrial property. These procedures apply to the entire industrial property, but not to portions already subject to the provisions of RCRA closure.

In 1984, the first year of ECRA applicability, New Jersey DEP's Office of Industrial Site Evaluation received 465 ECRA cases. Sixteen major cases generated about 28,000 tons of hazardous waste. Approximately one percent of the total was drummed liquid organic waste, and the remainder solids and sludges (mostly heavy metals). About 75 percent of this waste came from cleanup at one site (Ford).

Difficulty Estimating Quantities on Incomplete Information

As noted earlier, an extremely large amount of hazardous waste from past disposal practices is present in New Jersey. The combined effects of CERCLA remedial actions, RCRA closures (discussed in next section), and ECRA actions will result within the useful life of new facilities in the investigation of solutions for essentially all of this waste.

But future waste demand consists of several components. It may happen that one little-known component could overshadow the other components for which estimates are based on a thorough analysis of reliable and extensive data. That perhaps is the case with ECRA. This program is just getting under way. It is not possible to determine if the 1984 cleanups will be representative of future years' cleanups. By the same token, off-site removal may not remain the standard for site remediation.

The prudent course of action is to proceed in stages. Indeed, some off-site capacity must be developed for cleanup waste. Capacity should be specified for the demand which can be projected with a reasonable degree of certainty. Additional projection must wait until a direction is clearly established and supported by experience.

This may understate eventual demand, and thus require updates in the Plan. The Act (NJSA 13:1E-49, et al.) recognizes the need for such updates and requires them every three years, sooner if necessary. This course will reduce the current shortfall in facility capacity, but may delay elimination of the shortfall. In such a case, waste which cannot be managed off site could be maintained in a temporary "containment mode" until the needed off-site capacity is developed for permanent solutions.

In contrast, to overstate the demand could lead to siting more facilities than what might be proven necessary to meet the needs of New Jersey. This could jeopardize the entire New Jersey siting process and make facilities financially vulnerable.

Quantity Estimates

Based on the considerations presented above, the consultant estimates that in order to accommodate wastes from site cleanup activities within the state, the Facilities Plan should be structured to handle the annual waste quantities indicated in Table 4-2.

The estimates for drummed wastes were arrived at by reviewing the cleanup plans for sites that appeared to have drummed wastes available for off-site disposal. To account for the possibility of encountering either greater than expected amounts of drummed wastes or additional sites, this number was roughly doubled. Added to this was approximately 2,000 tons per year of drummed waste (approximately 8,000 drums) that might be reasonably expected from ECRA cleanups.

The draft Plan made a rough estimate that site cleanups would result in about 60,000 tons per year of solids and sludges being managed off-site. This figure does not change. This figure, though, was confirmed by recalculating likely quantities to be generated at specific sites having a high priority or where the amount of waste is too small for on-site solutions to be cost-effective. Despite the reevaluation of many sites and the addition of new sites, it is the consultant's judgment that the quantities presented in Table 4-3 are reasonable numbers for the purposes of planning for facilities in the time frame of this Plan.

Waste Types

Most of the drummed wastes can be expected to be organic liquids such as solvents and a wide variety of other organic residues, both liquid and semi-solid. Some drummed aqueous wastes can be expected, most of it probably acids and/or metal solutions. However, inorganic drummed wastes will probably represent a small fraction of the total. Given the wide variety of wastes expected, at least some wastes will be incinerable.

Most waste oils should be incinerable, though many will be contaminated with PCBs and require special incinerator operating conditions. Some sludges also, such as oily sludge, may be incinerable. However, it is reasonable to expect that fixation and/or disposal into a secure landfill will be the most appropriate disposal method for this group of wastes. Possibly no more than ten percent of the total quantity of sludge and contaminated soil will have sufficient organic content to warrant incineration.

TABLE 4-2

PROJECTED ANNUAL QUANTITY OF WASTE AVAILABLE FOR OFF-SITE DISPOSAL AROUND 1988 FROM CERCLA AND ECRA ACTIONS

Type of Waste	Projected Quantity of Waste Most Likely[1,2] Expected (tons/yr)
Drummed Waste (expected to be mostly organic liquids and residues)	6,000
Bulk Oils (many with PCBs)	6,000
Sludges and Contaminated Soil (mostly contaminated with oils and other organics)	60,000
Bulk Aqueous Wastes (mostly with organics)	6,000
	78,000

1 These are order of magnitude projections based on limited information.

2 Actual quantities are dependent on the specific requirements stipulated in the site Remedial Action Management Plan (RAMP) or Remedial Investigation and Feasibility Study (RI/FS).

TABLE 4-3

PROJECTED CLEANUP WASTES
BY TREATABILITY CODES

Type of Waste/Treatability Codes	Projected 1988 Quantity (tons/yr)
Drummed Wastes	
Combustible Liquid Waste, N.O.S.	4,000
Organic Solids and Sludges, N.O.S.	2,000
Bulk Liquids	
Oils, N.O.S.	2,000
Liquids with Toxic Organics	4,000
Bulk Aqueous Wastes	
Aqueous with Organics	6,000
Sludges and Contaminated Soils	
Combustible Sludges	6,000
Sludge, N.O.S.	54,000
TOTAL	78,000

Recognizing that the treatability of cleanup wastes cannot be determined in the absence of detailed site investigations, it is still useful to assign projected waste quantities to treatability categories to enable an assessment of facility needs. Table 4-3 details projected cleanup wastes by treatability categories determined by considering the possible waste characteristics outlined above.

Future Analysis

It should be noted that wastes from CERCLA and ECRA actions will be a primary focus of the next Plan update. More reliable data and greater experience with site cleanups will allow for a more intensive, definitive evaluation.

Table 4-3 details projected cleanup wastes by treatability categories patterned after the considerations outlined above.

SHIFT FROM ON-SITE TO OFF-SITE FACILITIES

Data Sources

The Bureau of Hazardous Waste Engineering (BHWE) in New Jersey DEP's Division of Waste Management reviews engineering designs and registration applications of existing or proposed hazardous waste facilities. Non-commercial hazardous waste surface impoundments, though, are regulated by the Bureau of Groundwater Resources Management in the Division of Water Resources. Source documents used by both the BHWE and Ground Water Resources concerning on-site facilities include:

- Permit Applications (Parts A and B)
- Annual TSDF Reports
- Permit Applications and Plans for Reconstruction, Expansion, or Other Facility Modifications
- Closure Plans

Selection of On-Site Facilities

The BHWE estimates that as many as 378 plants have filed RCRA Part A applications for RCRA interim status since November of 1980. At present, about 200 facilities are operating under interim or final RCRA status. The other facilities have either closed or were determined to fall outside the scope of RCRA regulation. Twenty-nine of the operating, RCRA-regulated facilities are commercial facilities, though one (Reichhold Chemical) has only limited commercial activity and another (Emergency Technical Services Corporation) is a small specialized operation expected to close in June.

Most of the non-commercial, RCRA-regulated facilities (as many as 150 facilities) are permitted for storage only. Of the remaining fifty facilities, 25 are surface impoundments.[1] The others were those whose Part A applications indicated the existence of some treatment or disposal process on site. Table 4-4 lists the treatment/disposal facilities. Table 4-5 lists the surface impoundments.

Anticipated Facility Closures

Treatment Facilities

The consultant interviewed the staff of EPA Region II, New Jersey DEP's Field Enforcement Operations, and Bureau of Hazardous Waste Engineering regarding the on-site treatment/disposal facilities listed in Table 4-4 as well as the major on-site storage facilities. Information from these sources and from the facilities themselves was obtained to identify any facilities which have indicated their intention to initiate closure or which New Jersey DEP may move to close due to engineering or compliance considerations. It was found that closure at any currently operating on-site facilities is not expected.

Surface Impoundments

Regarding on-site surface impoundments, Groundwater Resources expects closure at fifteen facilities. Two facilities (ARC Cessna and LCP Chemical) have completed closure, and one facility closure (National Smelting) was evaluated in the Cleanup Plan. Closure plans are currently being prepared by or evaluated for the remaining facilities. Because of the 1988

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1 Two facilities with surface impoundments are commercial facilities (duPont and Rollins).

TABLE 4-4

ON-SITE FACILITIES REVIEWED FOR
COMMERCIALIZATION OR CLOSURE POSSIBILITIES

	Facility Name and Identification	Treatability/ Disposal Codes*
a.	Allied Chemical Company Elizabeth, NJD002451490	(D82, T02)
b.	American Cyanamid Company	
	Princeton, NJD002349009	(T04)
	Bound Brook, NJD002173276	(T03, T04)
c.	Arsynco, Inc. Carlstadt, NJD044688935	(T03)
d.	Ciba Geigy Corporation Summit, NJD001316713	(T03)
e.	Englehard Minerals and Chemicals Corp. East Newark, NJD002141489	(T03)
	Englehard Industries Division	
	Carteret, NJD041211392	(T03)
	Newark, NJD064274657	(T04)
g.	Gateway Terminal Service, Inc. Carteret, NJD055933030	(T03)
h.	Hercules, Inc. Kenvil, NJD002170710	(T04)
i.	International Business Machines Dayton, NJD002177210	(T04)
j.	International Flavors and Fragrances, Inc. Union Beach, NJD002139228	(T03)
k.	International Paint Company, Inc. Union, NJD002139228	(T04)
l.	Jersey Smelting and Refining Jersey City, NJD000540062	(T04)

TABLE 4-4 (continued)

	Facility Name and Identification	Treatability/ Disposal Codes*
m.	McWilliams Forge Company, Inc. Rockway, NJD002183600	(T04)
n.	Mobil Oil Corporation Paulsboro, NJD002342426	(T04)
o.	Mobil Research and Development Corp. Pennington, NJD075481598	(T04)
p.	Monsanto Company Bridgeport, NJD001700707	(D80)
q.	Ortho Diagnostic Systems, Inc. Raritan, NJD006875424	(T03)
r.	Ortho Pharmaceutical Corporation Raritan, NJD002144202	(T03)
s.	Pantasote Film, Inc. Passaic, NJD03239826	(T03)
t.	Penick Corporation Newark, NJD991291642 Lyndhurst, NJD081894842	 (T03) (T03)
u.	Polyrez Company, Inc. NJD002330322	(T03)
v.	Shell Chemical Company Woodbury, NJD002482602	(T04)
w.	Sherwin Williams Company Newark, NJD002451870	(T04)
x.	Singer Company, Kearfott Division Little Falls, NJD002148484	(T04)
y.	Union Carbide Piscataway, NJD002444719 Keasbey, NJD000632000	 (T03) (T03)

TABLE 4-4 (continued)

	Facility Name and Identification	Treatability/ Disposal Codes*
z.	USR Optonix, Inc. Washington Township, NJD049487887	(T04)
aa.	Vanguard Research Associates, Inc. South Plainfield, NJD990753493	(T03)
bb.	Weyerhaeuser Company Barrington, NJD000768267	(T04)
cc.	Witco Chemical Corporation Paterson, NJD002163350	(T04)

* Description of Treatability/Disposal Codes
(Source: RCRA Part A applications)

T01 - Treatment in tanks
T02 - Treatment in impoundments
T03 - Incineration
T04 - Other treatment
D80 - Disposal in a landfill
D81 - Disposal by land application
D82 - Ocean disposal
D83 - Disposal in an impoundment

TABLE 4-5

ON-SITE SURFACE IMPOUNDMENTS

a. American Cyanamid (Bound Brook)
b. American Standard (Trenton)
c. ARC Cessna (Boonton)
d. Chevron (Perth Amboy)
e. U. S. Army, Picatinny Arsenal (Dover)
f. Cooperative Industries/Simmonds Precision (Chester)
g. E. I. duPont (Deepwater)
h. Electronic Parts Specialty (Lumberton)
i. Federated Metals (Newark)
j. Jersey Central Power and Light Company Gilbert Generating Station (Holland Township)
k. International Flavors and Fragrances (Union Beach)
l. Johanson Manufacturing (Boonton)
m. LCP Chemicals (Linden)
n. Lenox China (Pomona)
o. Vineland Chemical (Vineland)
p. Yates Industries (Bordentown)
q. Nuodex (Fords)
r. RFL Industries (Boonton)
s. Rollins Environmental Services (Bridgeport)
t. Shield Alloy (Newfield)
u. Struthers-Dunn (Pitman)
v. Southland (Great Meadows)
w. Tenneco (Flemington)
x. Ciba-Geigy (Toms River)
y. National Smelting (Pedricktown)

deadline to have all surface impoundments in compliance with the new land disposal regulations, the New Jersey DEP has assigned high priority to surface impoundment closures. Closures at these facilities will be completed by 1988, with the possible exception of American Cyanamid in Bound Brook. This facility has many impoundments on site that may be required to close under RCRA. The cleanup option for this and other large sites is still being evaluated. It is too early to include projections of these quantities in the Plan.

Most continuously-generated waste once handled by surface impoundments will be managed after closure by other on-site management methods. In many cases, the decision to close impoundments was influenced by the availability of other on-site options. However, it is estimated that about 2,000 tons of aqueous wastes will come off site as a result of closure, one-half aqueous organic waste and one-half aqueous inorganic waste.

Shifts Identified in Manifest Data

It should be noted that some facilities closed during 1982. The most notable example was duPont's Gibbstown aqueous waste treatment plant. That waste is now being sent to Chambers Works. Shifts of this waste and other wastes to the commercial market from plants closed during the three-year period for which this Plan examined data were already reflected in the manifest data. With the exception of duPont's waste, on-site to off-site shifts did not markedly impact manifested waste quantities.

Cessation of Ocean Disposal

According to the U.S. EPA Region II office, EPA expects to strictly implement the phase-out schedules on which New Jersey's one ocean disposer with a RCRA-regulated waste has been placed. This is part of EPA's general policy to fast-track the cessation of ocean disposal in the United States. This waste, about 38,000 wet tons in 1983, is an acidic waste. The current disposal permit expires in June 1985. Though the company is presently investigating a variety of alternative waste management methods should that permit actually not be renewed, it is likely that this waste will be treated on site and possibly discharged to a POTW. The cessation of industrial waste ocean disposal, then, is not expected to exert a significant additional demand on New Jersey commercial facilities.

Other On-Site Facility "Delistings"

Of the original number of on-site facilities granted interim status, it has been noted that several facilities have been "delisted" as RCRA facilities because of the following reasons:

1. their waste is not hazardous (e.g., United States Gypsum Company in Port Reading, American Cyanamid in Linden),

2. their Part A listing was actually for a future facility for which plans have been dropped (e.g., Gateway Terminal Corporation in Carteret, Mobil Research and Development in Pennington),

3. the activity at the facility is not regulated under RCRA (e.g., Pantasote Film in Passaic, McWilliams Forge in Rockaway), or

4. the plant has ceased its manufacturing/commercial operations (e.g., NL Industries in Pedricktown, Curtiss-Wright in Wood-Ridge).

Such "delistings" of facilities have no impact on the demand for commercial facilities.

Wastes Managed at On-Site Facilities

Data Source

Wastes which are managed on site by the generator need not be manifested, and as a result manifest data cannot be used to analyze the amounts and types of such wastes. However, New Jersey DEP requires annual reports for all facilities that store, treat, or dispose of hazardous waste, including on-site facilities.

The consultant analyzed 318 annual reports submitted for 1983 on-site facilities. Of the 318 facilities, 76 reported managing no hazardous waste in 1983.

Types and Quantities of On-Site Wastes

Based on the remaining 242 annual reports, 11,767,000 tons per year of hazardous wastes are produced and treated, stored, or disposed of on-site in New Jersey. The distribution of this total among the 242 generators is as follows:

Number of Generators	Cumulative Amount Reported by Generators	Percentage of Total On-Site Wastes in New Jersey
3	10,565,000 tons/yr	89.8
16	1,118,000	9.5
41	72,000	0.6
182	12,000	0.1

Largest Generators

Thus, sixty firms account for 99.9 percent of the hazardous waste managed on site. The three largest generators are Toms River Chemical, Merck and Company, and Monsanto. These three firms classified virtually all, in excess of 99.98 percent, of their on-site waste under the EPA system as being D002, wastes with the characteristic of corrosivity. These wastes are predominantly water with either a strong acid or alkali which can be neutralized in on-site treatment facilities and discharged to surface water, subject to federal and state water pollution control regulations. To account for such quantities, each facility would process, on an average, over two million gallons of wastewater each day, a level not unusual for plants the size of Toms River Chemical, Merck and Company, and Monsanto.

Types of Wastes

Table 4-6 shows how wastes are managed on site by type and quantity of waste and by management method. This is based on an analysis of all waste streams reported by a facility to be greater than 100 tons during 1983. Such size streams accounted for 99.7 percent of the total of 11,767,000 tons reported for 1983 on-site facilities in New Jersey.

TABLE 4-6

ESTIMATED WASTE TYPES, MANAGEMENT, AND QUANTITIES AT NON-COMMERCIAL FACILITIES IN NEW JERSEY (Tons for 1983)

	On-Site Management Method					
Types	Storage	Aqueous Treatment	Incineration/ Energy Recovery	Other Treatment	Unknown	Total (rounded)
Aqueous Liquids	89,600	11,168,000	--	--	--	11,258,000
Solvents	13,700	--	--	6,700	--	20,000
Oils	1,300	--	500	--	--	2,000
Other Liquids	284,000	--	3,700	12,300	--	300,000
Sludges and Solids	87,600	--	1,800	65,800	--	155,000
Not Examined	--	--	--	--	32,000	32,000
TOTAL (rounded)	476,000	11,168,000	6,000	85,000	32,000	11,767,000

Total Hazardous Waste Generated in New Jersey

Adding the normalized amount of 403,000 tons manifested in 1983 (Chapter Two) to the 11,767,000 tons managed on-site provides an estimate of over 12,000,000 tons of hazardous waste produced in New Jersey in 1983. Four points should be made about this estimate:

1. The on-site figure has not been normalized.

2. Some double accounting seemingly occurs because a generator reporting storage of waste on site in 1983 may have manifested this waste off site in that year as well.

3. The estimate excludes small-quantity generators.

4. The level of hazard associated with each waste is an important element in the analysis of commercial and on-site management of waste.

If the aqueous wastewater generated from the three aforementioned firms is excluded from the total on-site hazardous wastes managed, then 1,200,000 tons of hazardous wastes may be considered to be managed on site (this number still includes some wastewater generated by smaller firms). Adding the normalized amount of waste manifested in 1983 to this revised estimate of on-site wastes gives a total of 1,600,000 tons per year. Manifested wastes make up 25 percent of this total. When this Plan is adopted by the Commission, these estimates will continue to undergo refinement with new data analyzed as they become available.

BURNING OF WASTES IN BOILERS

Currently Exempted Practice

Burning hazardous wastes and waste-derived fuels in industrial boilers as auxiliary fuels is defined as a beneficial use exempted from RCRA coverage. Both the New Jersey DEP's Division of Environmental Quality and the U.S. EPA (Section 3004(q) of the 1984 RCRA Amendments) intend to regulate this practice more stringently, most likely resulting in the discontinuance of this practice for certain types of wastes and equipment. This more stringent regulation will likely exert some additional demand for off-site facilities.

Because the boilers are presently exempted, the quantity of waste burned in boilers is not reported in annual reports submitted by treatment, storage, and disposal facilities nor is it included with the manifest data if the waste is managed on site. Even if generated and manifested first to a fuel blending facility, requirements for manifesting waste-derived fuels are ambiguous. Thus, there is no data management system which is currently in force and specifically designed to monitor the quantity and quality of wastes and waste-derived fuels in industrial, commercial, or residential boilers. The analysis in this section is based then on partial information available from the Air Pollution Enforcement Data System and the manifest data system. The personnel of New Jersey DEP's Bureau of Air Pollution Control assisted the consultant in developing the following methodology for estimating the quantity of waste and waste-derived fuels burned in boilers.

Bureau of Air Pollution Control Data

The New Jersey DEP's Bureau of Air Pollution Control operates the Air Pollution Enforcement Data System (APEDS) to maintain information on the construction, installation, alteration, or operation of air pollution control apparatus or equipment. Source data contained in the APEDS identify fuel burning equipment which are reported to be burning wastes as a primary or secondary fuel. The Bureau of Enforcement Data Management obtained this information from APEDS and reviewed the final data base prepared by the consultant.

The APEDS identified boilers which are burning either "waste solvents" or "reprocessed oils". In some of these cases, more information was obtained about the wastes from original permit/certificate applications. The data finally assimilated from APEDS and the permit applications is given on Table 4-7.

Additional Burning of Waste in Boilers

It must be noted that more wastes and waste-derived fuels are burned in boilers than identified by Table 4-7. Some waste-derived fuels may have been reported in terms of the American Society for Testing and Materials (ASTM) fuel designations (No. 4, 5, or 6 Fuel Oil). If so, they are not included in Table 4-7 because the APEDS system cannot distinguish between cases of ASTM designations used for waste-derived fuels and the same ASTM designations used for petroleum-based virgin fuels.

TABLE 4-7

A DATA BASE ON BOILERS BURNING WASTE AS FUEL IN NEW JERSEY
BASIS: AIR POLLUTION ENFORCEMENT DATA SYSTEM

SIC Code	Industry Group Name	Rated Gross Heat Input BTU/Hr	Waste Type	Fuel Category	Heating Value BTU/Lb (estimated)	Percent of Fuel Usage (estimated)	Specific Gravity (estimated)	Ash Content (%)	Sulfur (%)	Waste Quantity Tons/Yr (estimated)	Waste Quantity Gal/Yr
28	Chemicals and Allied Products	55×10^6	Oil	Secondary	9,240	32	0.91	0.30	0.01	3,988	1,051,000
28	Chemicals and Allied Products	55×10^6	Oil	Secondary	19,240	32	0.91	0.30	0.01	3,988	1,051,000
28	Chemicals and Allied Products	187×10^6	Solvent	Secondary	14,000	1	0.85	N.A.	N.A.	3,523	994,000
28	Chemicals and Allied Products	28×10^6	Oil	Secondary	19,240	17	0.91	0.20	0.06	569	150,000
28	Chemicals and Allied Products	175×10^6	Solvent	Secondary	19,300	61	0.85	0.01	0.10	1,482	418,000
28	Chemicals and Allied Products	100×10^6	Oil	Secondary	19,240	63	0.91	0.01	0.10	1,586	418,000
28	Chemicals and Allied Products	11×10^6	Mineral Spirits	Primary	21,300	63	0.80	0.02	1.57	217	65,000
28	Chemicals and Allied Products	11×10^6	Mineral Spirits	Primary	21,300	63	0.80	0.02	1.57	217	65,000
28	Chemicals and Allied Products	26×10^6	Solvent	Primary	14,000	100	0.85	0.01	0.01	10,166	2,868,000
28	Chemicals and Allied Products	25×10^6	Solvent	Secondary	17,600	8	0.85	0.12	0.01	71	20,000
28	Chemicals and Allied Products	25×10^6	Solvent	Secondary	17,600	8	0.85	0.12	0.01	71	20,000
28	Chemicals and Allied Products	25×10^6	Solvent	Secondary	17,600	8	0.85	0.12	0.01	71	20,000
29	Petroleum Refining	32×10^6	Raffinate	Primary	19,000	54	0.85	0.0	0.0	8,656	2,442,000
29	Petroleum Refining	0.5×10^6	Light Naptha	Primary	14,000	100	0.85	0.01	0.01	71	20,000
36	Electrical and Electronic Machinery	$2(13 \times 10^6)$	Solvent	Secondary	14,000	3	0.85	0.18	0.01	280	79,000
36	Electrical and Electronic Machinery	10×10^6	Vinyl Plasticizer	Secondary	14,000	5	0.85	0.03	0.01	71	20,000
39	Miscellaneous Manufacturing	4×10^6	Vinyl Plasticizer	Secondary	14,000	7	0.85	0.03	0.01	28	8,000
49	Electric, Gas, Sanitary Svcs.	17×10^6	Sewage Oil	Primary	14,700	100	0.91	7.74	2.68	3,726	982,000
Total Quantity (rounded)										39,000	11,000,000

It should also be noted that information in APEDS is kept updated more in terms of air emission sources, stacks, and control equipment, rather than in terms of fuel types and fuel consumption. For example, initial information from APEDS identified 21 waste burning boilers at 14 plants. Subsequent review of the files revealed that one boiler has changed over from waste solvents to No. 6 fuel oil, whereas two boilers at another plant burned waste solvents only on an experimental basis. Table 4-7 now lists only eighteen boilers at twelve plants.

Discussions with New Jersey DEP facility inspectors indicate that waste burning is carried out in at least sixteen more plants, though this has not yet been entered in the APEDS. Table 4-7 also excludes residential and commercial boilers because no data are available. Under these circumstances, the data base on Table 4-7 should be looked upon merely as a rough indicator of the current practice of burning wastes which have been largely generated on site.

Quantity of Waste Reported in APEDS

As shown in Table 4-7, the total quantity of wastes currently reported in APEDS is about 11 million gallons per year (estimated to be about 39,000 tons per year). The rated gross heat input of these boilers range from 0.5 million BTU per hour to 187 million BTU per hour. The estimated quantity of wastes burned in boilers having a rated gross heat input greater than 20 million BTU per hour is about 34,000 tons per year (90 percent of reported wastes). The percent of firing rate supplied by wastes (percent of fuel usage) is greater than 25 percent in the case of five out of the eleven boilers with rated gross heat input greater than 20 million BTU per hour.

Manifest Data

It is possible to obtain some preliminary information on waste-derived fuels from manifest data. The New Jersey manifest system provides information on the quantities of waste oils transported in New Jersey because waste oil is regulated as a hazardous waste (identified by the New Jersey waste codes X721 through X728). The quantities of waste oils manifested in New Jersey during 1981, 1982, and 1983 are given in Table 4-8. It should be noted that some of the wastes comprising "generation" are double-counted. Further, not all of the waste oils are manifested to fuel blending facilities in New Jersey; some were sent to other types of facilities or

TABLE 4-8

WASTE OILS MANIFESTED IN NEW JERSEY
DURING 1981, 1982, AND 1983[1]
(All Quantities in Tons)

NJ/EPA Waste Code	1981 Generated	1981 Exported	1981 Imported	1982 Generated	1982 Exported	1982 Imported	1983 Generated	1983 Exported	1983 Imported
X721	31,936	4,759	7,088	25,667	937	9,311	39,720	3,650	9,088
X722	9,925	1,457	1,288	8,600	2,646	2,375	11,689	3,764	7,231
X723	211	50	49	30	13	0	358	244	21
X724	7,978	185	3,125	1,515	96	120	1,893	299	0
X726	64,576	29,803	29,447	50,373	27,569	6,649	41,689	18,492	8,574
X727	13	0	24	4	2	0	101	85	8
X728	0	0	0	33	22	0	2,918	2,875	0
TOTAL QUANTITY	114,639	36,254	41,021	86,222	31,285	18,455	98,368	29,409	24,922

NORMALIZED QUANTITIES OF WASTE OIL MANIFESTED TO
FUEL BLENDERS BY TREATABILITY CATEGORIES[2]
(All Quantities in Thousands of Tons)

Treatability Categories	1981	1982	1983
Automobile Oils	24	22	37
Industrial Oils	32	36	27
Fuel Oils	4	6	11
Oils, N.O.S.	<1	2	3
TOTAL QUANTITY	60	66	78

1 Source: "An Analysis of the New Jersey Manifest Information 1981-1982: Interim Report", New Jersey Hazardous Waste Facilities Commission, January 1984, Table 1.

New Jersey Manifest Information.

2 Source: Chapter Two Report.

to fuel blending facilities in other states. The lower half of Table 4-8 gives a more accurate representation of waste oil generated in New Jersey and managed at fuel blending facilities, whether in New Jersey or another state.

New Jersey Fuel Blending Facilities

A current list of commercial fuel blenders in New Jersey and their estimated capacities are given in Table 4-9. The manifested waste transactions -- both receipt and generation -- at eight which specialize in fuel blending are presented in Table 4-10. Waste oils comprise most of the receipts, with solvents making up the remainder.

The average of waste receipts to the eight selected fuel blenders is 62,000 tons per year. The "generation" quantities shown in Table 4-10 represent some blended fuels, unusable oil, as well as bottoms, sediments, and water separated from the waste oil. Assuming that the discharge of separated water to a sewer amounts to ten percent of the receipts, the difference between receipts and generation for the selected fuel blenders in Table 4-10 indicates that 55 to 70 percent of receipts is incorporated into waste-derived fuel. This factor indicates that the eight selected New Jersey facilities blend at least 40,000 tons per year of waste into fuels.

Other Fuel Blending Operations

To obtain an estimate of the total amount of waste blended as fuel at New Jersey facilities, the figure of 40,000 tons needs to be increased to reflect:

a. Waste oil blended as fuels at other commercial facilities (such as Earthline-SCA, S&W Waste, and Standard Tank Cleaning Corporation).

b. Solvents blended as fuels at other commercial facilities (such as Marisol and SRS).

These are estimated to amount collectively to 20,000 tons per year, yielding a gross estimate of 60,000 tons per year of waste present in waste-derived fuels blended at commercial facilities in New Jersey.

TABLE 4-9

ESTIMATED CAPACITY OF COMMERCIAL FUEL BLENDERS IN NEW JERSEY[1]
(All Quantities in Tons Per Year)

Facility Name	Capacity
B&L Oil Corporation	15,000
BP North America	11,000
C. R. Warner, Inc.	20,000
Earthline-SCA Services	45,000
Flowen Oil Delaware Valley	18,000
L&L Oil Service, Inc.	18,000
Lionetti Waste Oil Service	13,000
Noble Oil Company	32,000
Oil Recovery Company	219,000
Pure Stream, Inc.	2,400
S&W Waste, Inc.	30,000
TOTAL CAPACITY	423,000 tons/year

1 Source: Chapter Three Report

TABLE 4-10

WASTE TRANSACTIONS OF EIGHT COMMERCIAL FUEL BLENDERS
IN NEW JERSEY DURING 1981, 1982, AND 1983[1]
(All Quantities in Tons)

Facility Name	1981		1982		1983	
	Receipt	Generation	Receipt	Generation	Receipt	Generation
B&L Oil Corporation	11,767	4,770	9,923	3,350	14,850	6,945
Flowen Oil	0	0	2,470	90	9,410	6,631
L&L Oil Service	7,542	2,880	8,906	2,460	8,810	2,672
Lionetti Waste Oil Service	7,952	7,800	6,871	4,450	13,542	5,902
Noble Oil Company	106	400	9,092	3,230	17,039	2,304
Oil Recovery Company	16,017	1,300	19,327	2,440	12,779	2,274
Perk Chemicals	819	640	547	420	720	224
Pure Stream	2,575	20	1,844	10	4,016	83
TOTAL QUANTITY	46,778	17,810	58,980	16,450	81,166	27,035

1 Source: "An Analysis of the New Jersey Manifest Information 1981-1982: Interim Report", New Jersey Hazardous Waste Facilities Commission, January 1984, Tables 18, 19, 20.

New Jersey Manifest Information.

Quantity of Waste Burned in Boilers

In summary, the APEDS data indicate that about 40,000 tons of waste is burned in industrial boilers. This waste must be assumed to have been largely generated on site, considering the limitations of the data base. On the other hand, the manifest data indicate that an additional 60,000 tons of waste is also burned every year in boilers, but not necessarily in New Jersey, after having first been blended as a waste-derived fuel at a commercial facility. These two data sources thus indicate that a total of 100,000 tons per year of waste are burned in boilers (or about 30 million gallons).

It is interesting to compare this estimate with the U.S. EPA's current nationwide study[2] of the practice of handling/burning "used or waste oils and waste-derived fuel materials". Track I of the study involved sending questionnaires to handlers and burners of used or waste oils and waste-derived fuel materials. These facilities were selected "from a prepared list, not a sampling frame with a known relationship to the population of burners and handlers". The results of this survey are, therefore, "not generalizable" and the "reported quantities do not account for all the used or waste oils and waste-derived fuel materials handled or burned".

These preliminary results, however, indicate that at least 275 million gallons of used or waste oils and waste-derived fuel materials were burned during 1982 in the United States. This includes the quantities reported by sampled burner facilities as having been burned and the quantities identified by sampled handler facilities as materials which "was/will be burned as fuel" on site. Knowing that the sampled facilities do not fully cover all handlers/burners in the United States, the U.S. EPA has carried out a separate analysis to estimate that as much as 500 million gallons of waste oil alone can be involved. In comparison, the estimate of thirty million gallons of waste oil and solvents for New Jersey, as prepared in this report, seems reasonable.

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2 "Methodology Report for the Survey of Handlers and Burners of Used or Waste Oil and Waste-Derived Fuel Material (Survey of Waste as Fuel: Task I)". Report to U.S. EPA by Westat, February 1984. pp. 6-1 and 6-2.

Proposed New Regulations on Burning Waste in Boilers

New Jersey DEP's Division of Environmental Quality is now drafting more stringent regulations on the use of liquid fuels in industrial boilers. The regulations will consist of two parts: (a) liquid fuel standards and (b) boiler exemption rules. These regulations are expected to be effective in about six to twelve months.

The proposed liquid fuel standards include concentration limits on the following contaminants: ash, sulfur, arsenic, beryllium, cadmium, chromium, lead, mercury, nickel, polychlorinated biphenyls (PCBs), and total halogen. Other properties covered by the regulations involve flash point and heat of combustion. It should be noted that these standards will apply to all fuels and are basically designed to control air pollution due to emissions from boilers.

A fuel oil from a petroleum refinery will usually meet the standards, though some samples of these fuel oils will not pass the test for nickel or chromium. Waste-derived fuels are expected to fail this test more often, thereby preventing their use in boilers without the appropriate air pollution controls such as scrubbers.

Even if a waste-derived fuel material meets the standards, compliance with the boiler exemption rule is also required. These additional criteria define allowable boiler size, stack height, air monitoring requirements, and beneficiality of the reuse of waste-derived fuel. The rule also provides for certification to operate control apparatus or equipment. The minimum boiler capacity specified by the boiler exemption rule is 20 million BTUs per hour, and it is estimated that 1,100 boilers operating in New Jersey are rated for a gross heat input greater than this capacity.

Effect of Proposed New Regulations

If the liquid fuel standards are indeed promulgated as described above, the issue of the future impact of these standards on the practice of burning waste-derived fuel materials will mainly narrow down to two questions:

- What fraction of the waste-derived fuels, offered for analysis, will meet with the proposed standards?

- For the fuels that fail the standards, what collective capacity of boilers with the appropriate and necessary air pollution controls will be offered for the combustion of waste-derived fuels?

The answer to the first question is probably that waste-derived fuels (unless blended down substantially with virgin fuel) may often not meet the standards. This is based on New Jersey DEP's testing of samples carried out in connection with the development of the standards.

In answer to the second question, the New Jersey DEP estimates that nearly 400 boilers may have appropriate controls to enable their utilization for such purposes. This is based on the fact that these number of boilers are rated for a gross heat input of greater than 100 million BTU per hour and would probably have suitable air pollution control facilities. Even with this large number of seemingly acceptable boilers, it is difficult to assess at this stage whether the boiler owners will consider burning fuels which have failed fuel standards. These large boilers represent major investments and can be essential to the owners' overall operations. These factors may prevail despite the cost savings of replacing virgin fuels.

It is premature to attempt to quantify the impact of regulations in a drafting stage on a widely prevalent industrial practice. However, since proposed fuel standards are related to the capabilities of fuel burning equipment and, since several issues need to be considered before finally promulgating fuel standards, it is the consultant's estimate, as explained below, that the practice of burning wastes and waste-derived fuels in boilers will not be affected so as to substantially increase the total 1988 demand for off-site facilities.

Waste Burned on Same Site as Generated

Any curtailment of the practice for waste generated on site would seemingly increase the demand for off-site facilities because these wastes are not now manifested. However, two factors suggest that this will not occur to a large degree. First, as shown in Table 4-7, this practice occurs mostly in large boilers which likely will meet the boiler exemption rules and whose owners probably have already considered the issues of combustion efficiencies and potential for boiler damage. Second, even if the practice is curtailed, on site management via another alternative could still prove more attractive to the generator than shipping the waste off site.

Assuming discontinuance of the current burning of wastes in boilers rated for gross heat input below 20 million BTU per hour, it is expected that only 4,600 tons per year (refer to Table 4-7) of the amount reported as generated and burned on site (40,000 tons) will be shifted to off-site management facilities. Because not all boilers burning wastes and waste-derived fuels are included in the APEDS system, it may be expected that this amount of waste shifted to off-site management facilities will likely double to equal about 9,000 tons per year.

Wastes Blended into Fuels at Commercial Facilities

Change will likely be more pronounced in the practice of burning waste-derived fuels (blended at a commercial facility) in boilers. The cost savings realized by replacing virgin fuels with waste-derived fuels is a compelling argument that the practice will still be attractive, but a shift to larger boilers should occur. The shrinkage of suitable boilers for burning the wastes and the added administrative costs to the boiler owner may reduce the demand for waste-derived fuels and thus result in lower prices. The competitive technologies of incineration and waste oil re-refining and the similar technology of burning in cement kilns should become more attractive. Nevertheless, any shift in the practice or use of waste-derived fuels blended at commercial fuel blending facilities would not increase the total estimate of manifested wastes because the manifest data already include wastes currently received by fuel blenders.

EFFLUENT REGULATIONS

Implementation of Effluent Regulations in New Jersey

The U.S. Environmental Protection Agency (EPA) has proposed or promulgated several regulations to limit the discharge of pollutants into navigable waters of the United States or to publicly-owned treatment works (POTW). The regulated effluent discharges are from facilities involved in different industrial activities. These regulations include effluent limitations based on "best practicable technology" (BPT) and "best available technology" (BAT), establish "new source performance standards" (NSPS), and define "pretreatment standards of new and existing sources" (PSNS and PSES). These regulations were promulgated under the Federal Water Pollution Control Act (also known as the Clean Water Act).

In many cases, the regulations will require additional treatment of wastewater prior to discharge, and this treatment may generate more solid wastes. These wastes, due to the presence of toxic pollutants, may be defined to be hazardous and covered by RCRA.

The Bureau of Industrial Waste Management, in New Jersey DEP's Division of Water Resources, is responsible for implementing industrial pretreatment programs and permitting the direct discharge of industrial wastewaters to surface streams. This group is currently dealing with several aspects of the pretreatment program, including the development of criteria to set the effluent limits under the industrial wastewater discharge permitting program. The Pretreatment Section is now obtaining baseline monitoring reports (BMR) from the categorical industrial users of POTWs.

Projecting Additional Waste Generation in New Jersey

Source documents for evaluating the impact of effluent regulations on hazardous waste management are not yet available in New Jersey. The consultant's methodology for projecting additional hazardous waste generation in New Jersey due to effluent regulations was based on the supplementary information provided by the U.S. EPA, including:

- Development documents for effluent limitations guidelines and standards for point source categories

- Economic analysis of proposed effluent standards and limitations for industries

- Federal Register notices on the proposal/promulgation of effluent regulations

The following is a brief description of the methodology:

Step 1 - Study of EPA Information

Select industrial activities for analysis; identify the related SIC codes; note the status of pertinent effluent regulations; review EPA's evaluation of the non-water quality impact of given regulations, their prediction of types and quantities of solid wastes, and classification of these wastes as being hazardous.

Step 2 - Development of Waste Generation Factors

Review EPA data on predicted waste quantity per plant on a national basis.

Step 3 - Extrapolation to the Case of New Jersey

Identify the industrial basis (number of plants within an industry category that EPA reviewed in developing the guidelines) from EPA's overview of the industry affected by given regulations; define corresponding industrial basis for New Jersey by counting similar plants listed in the state's manufacturers' directory; if similar plants could not be identified, use other factors (such as industry shipments, labor figures) to define the state's industrial base as a percentage of the national basis; apply waste generation factors to predict the generation of solid wastes in New Jersey.

Summary

Effluent regulations for twenty different industrial activities were studied in this analysis. The solid wastes expected are usually sludges with metals, though many will be organic sludges. At times waste oils may be generated, and some generators may decide to ship aqueous streams untreated off site rather than pretreat on site. In summary, the preliminary analysis predicts a total quantity of additional solid wastes of about 66,000 tons per year.

Data Base Normalization

It should be noted that this data base is a first attempt at quantifying the impact at a state level and likely contains some inaccuracies. There are several shortcomings in this methodology:

- Projecting for a specific state by using a waste generation factor which is calculated from a national data base may lead to error.

- This method does not take into consideration the subcategorization of industrial activities which form subparts of several effluent regulations. For example, plants in different subcategories (wood preserving, plywood, hardboard, etc.) of the same industrial activity (timber products) may be affected differently by regulations.

- Some companies are referenced with more than one SIC in a manufacturers' directory. These companies' involvement in the secondary SIC activities may be at comparatively low levels; however, the methodology for defining the industrial base did not distinguish such.

- Some generated solid wastes may not be hazardous.

- Several plants may already be in compliance with the forthcoming regulations; thus, they would not generate any additional waste.

Under these circumstances, it was necessary to revise the preliminary estimates based on judgment and experience. The Pretreatment Section of New Jersey DEP receives the baseline monitoring reports and has been conducting waste surveys of several industrial users of POTWs, and thus represents the most knowledgeable source about pretreatment in New Jersey. The staff of the Pretreatment Section made the following observations:

- The number of plants in each of the selected categories were probably overestimated; this is especially true of inorganics and electroplating industries.

- It must be noted that several facilities which are not treating their effluent may prefer to change their processes rather than construct treatment facilities.

- All plants in iron and steel industry in New Jersey discharge directly to surface water and, therefore, are not subject to pretreatment standards.

- Additional wastes generated may be managed on site.

- Some solid wastes generated may not be hazardous (such as those generated by can making and copper forming as well as sludge precipitation by treatment with lime).

- Based on these facts, the predicted waste quantities for New Jersey could be reduced across the board by fifty percent.

The consultant reviewed these remarks and reduced the preliminary estimates by fifty percent. The final summarized projections are given on Table 4-11 in terms of the generating industry, waste types, and quantities.

EFFECT OF DEVELOPMENTS IN NEIGHBORING STATES ON NEW JERSEY FUTURE WASTE IMPORTS AND EXPORTS

Proposed or future regulations in neighboring states, as well as changes in the availability of commercial facilities in these states, will affect to varying degrees New Jersey waste imports and exports. Reasonable sources of information on these RCRA developments are the environmental regulatory agencies in these states. The consultant contacted the regulatory agencies in New York, Connecticut, Pennsylvania, Delaware, Maryland, West Virginia, Ohio, Michigan, Vermont, New Hampshire, Maine, Massachusetts, Rhode Island, Virginia, Kentucky, Indiana, Tennessee, South Carolina, Georgia, and Alabama.

In general, the consultant made inquiries regarding two major issues:

a. RCRA Program Changes (i.e., planned listings of waste streams, new regulations which may either increase statewide manifested wastes or affect out-of-state imports).

b. Changes in Availability of Commercial Facility (e.g., commercial facility closures, proposed new commercial facilities, reopening of closed facilities).

The following summation is based on the responses of the individuals contacted at the state agencies.

TABLE 4-11

ESTIMATE OF FUTURE GENERATION OF HAZARDOUS WASTE
RESULTING FROM ADDITIONAL INDUSTRIAL WASTEWATER TREATMENT
IN NEW JERSEY
(Tons Per Year)

		Treatability Categories					
Industry	SIC Codes	Heavy Metal Sludge	Sludges, NOS	Corrosive Sludges	Aqueous Liquids with Organics and Metals	Waste Industrial Oils	Totals (Rounded)
Timber Products	24	--	10	--	--	--	10
Chemicals and Allied Products	28	16,300	2,600	--	300	--	19,200
Leather and Leather Goods	31	--	500	--	--	--	500
Primary Metals	33	3,100	1,200	1,000	--	3,200	8,500
Fabricated Metals	34	1,400	300	--	--	--	1,700
Machinery, except Electrical	35	--	300	--	--	--	300
Electrical and Electronic Machinery	36	1,300	300	--	--	--	1,600
Transportation Equipment	37	--	300	--	--	--	300
Measuring, Analyzing, Controlling Instruments	38	--	300	--	--	--	300
Miscellaneous Manufacturing	39	--	300	--	--	--	300
TOTALS (rounded)		22,100	6,100	1,000	300	3,200	33,000

RCRA Program Changes

1. Planned listing of waste streams as RCRA wastes other than those a state has already designated or those wastes that EPA will list:

   - Northeast: Listings should not increase current imports to New Jersey.

     New listings typically involve small quantities of exotic wastes. The only exception to that is New Hampshire which intends to list waste oils within two years. However, existing waste oil recovery capacity in New England should suffice.

   - Midwest: Listings should not increase current imports to New Jersey.

     Indiana may consider regulating waste oils, but a proposal is not even in draft form yet.

   - South/Southeast: Listings should not increase current imports to New Jersey.

     Tennessee may attempt to regulate waste oils, though a proposal to do so was once rejected by the Waste Management Review Board.

2. Planned regulation of PCBs as hazardous wastes:

   - Both Indiana and Maryland intend to regulate PCBs; however, this should not change the current waste management practices for those wastes. Besides, no New Jersey facilities can currently accept them.

3. Other state-initiated changes in state regulations effecting a marked increase in the demand for commercial facilities, its own or New Jersey's.

   - Northeast: None

   - Midwest: Probably none

     Ohio expects to lower the small quantity generator exemption to 100 kg/mo. No estimates are available for waste quantities, but it is likely that they are modest. Furthermore, small quantity generators are likely to seek some alternative to shipping their wastes to New Jersey, given the cost of transportation.

- South/Southeast: Probably none

  The same situation occurs in Maryland as in Ohio. Some waste will probably come up to New Jersey, but the quantity should not markedly impact the amount of waste Maryland is already exporting to New Jersey due to the modest amount collectively generated by small generators.

4. Restrictions on types of waste accepted at its commercial TSDFs:

- Northeast: Potential major impact.

  Starting 30 April 1984, New York prohibited the land disposal of waste containing more than five percent of certain listed "organic chemicals and pesticides" (mainly organic chemicals designated by OSHA as carcinogenic), with the percent being reduced to two percent by 31 December 1985. Starting 31 March 1985, New York will prohibit wastes containing in excess of five percent of halogenated, nitrogenated, and aromatic organic compounds and "certain other organic chemicals in Federal toxic waste regulations". The restricted chemicals include trichloroethane, chlorobenzene, carbon tetrachloride, nitrobenzene, aniline, benzene, toluene, acetone, and ethyl acetate. Also, New York's disposal fee, in place for about eighteen months, may effect a decrease in the amount of waste sent to CECOS and SCA-Model City.

- Midwest: Probably none

  Ohio rejects, procedurally but not statutorally, wastes requiring specialized or very advanced treatment for which the generator state has not aggressively sought TSD possibilities in its own state.

- South/Southeast: Probably none

  Alabama may move to restrict activities at Chemical Waste Management's large landfill in Emelle within the next six months. The form of those restrictions is not clear at this time, but they are likely to at least increase the cost. Actual availability to out-of-state generators may not be affected. South Carolina did have a piece of legislation in effect for a year restricting the land disposal of wastes that are prohibited for landfilling in the states where generated. That law has since been repealed and those wastes are once again being accepted.

<u>Changes in Availability of Commercial Facilities</u>

1. Expected commercial facility closures:

- Northeast: Significant reduction in capacity of landfills.

  Of six interim status landfills in Pennsylvania, four have closed, including three in eastern Pennsylvania that accepted New Jersey waste. Frontier Chemical Company, an aqueous treatment facility, in New York may close as the result of an enforcement action, but waste should be able to shift easily to other available facilities. Geochem Corporation in Massachusetts may close as the result of an enforcement action, but no New Jersey waste was manifested there.

- Midwest: Insignificant reduction in capacity of incineration, aqueous treatment, and landfill facilities.

  Environmental Enterprises in Ohio may close as the result of an enforcement action, but less than 20 tons of New Jersey waste was manifested there in 1982. Two off-site aqueous treatment plants in Ohio are threatened by the Part B process, but that should not impact New Jersey waste management. The large landfill operated by CECOS International in Ohio will probably be closed for a brief but unspecified period of time for repair of a new cell wall and two slopes which have failed.

- South/Southeast: Reduction in landfill and incineration capacity.

  Atlantic Coast Environmental in Delaware is threatened with closure because of the Part B process. In 1982, the facility accepted 400 tons of New Jersey waste, mostly D001 and D002. If closed, waste should be easily shifted to other facilities. The Browning-Ferris Industries (BFI) landfill facility in Maryland closed in early 1983, and a new landfill opened by a state authority will be closed soon.

Maryland's new landfill did not accept New Jersey waste and New Jersey waste sent to BFI has been shifted to other facilities.

2. Proposed new commercial facilities:

- Northeast: Many active proposals.

  In Pennsylvania, there are at least two proposals to site new land disposal facilities; one in the western part of the state and a third which is appealing the state's denial of its permit application. A landfill that had recently closed now proposes to reopen. All proposed landfills would accept only stabilized, inorganic waste.

  In Massachusetts, IT Corporation has withdrawn its plans to develop a major facility featuring rotary kiln incineration and stabilization/landfill disposal.

  A PCB oils/transformers treatment facility is planned in Maine. Though classed as commercial, it is supposedly restricted to equipment and oils from Central Maine Power.

  Stablex proposes in New Hampshire a chemical treatment facility with a landfill for treatment residues only. The facility is in the draft permit stage. Also in New Hampshire, ACT Corporation proposes a solvent recovery facility that is now in the draft permit stage.

  Conversion Systems, Inc. has inquired into possibility of building an incinerator in New York. Nothing formal has been submitted.

  In Rhode Island, Antonelli Plating Company has received a permit to construct a commercial facility to treat electroplating wastes. ETICAM Corporation is presently looking for a site for an electroplating waste treatment facility.

- Midwest: Significant proposal for incineration capacity.

  Waste Technologies, Inc. plans a large rotary kiln incinerator in Ohio near the Pennsylvania and West Virginia borders. EPA and the state have granted permits, but in early April the permit was remanded by EPA pending settlement of a suit brought by the State of West Virginia. Settlement is likely. Also, in Ohio, TRICIL Environmental proposes a treatment plant for electroplating wastes. This is planned primarily for the Cleveland area electroplating industry, but it will likely expand its commercial base following the beginning of operations.

Environmental Management Systems, Inc. in Michigan has received a lengthy notice of deficiency on original Part B for landfill/solidification process/wastewater treatment plant, but plans to resubmit a Part B shortly for the landfill only.

- South/Southeast: Various proposals.

In Kentucky, Pyrochem, Inc. proposes an incinerator. The Part B has been reviewed and found deficient in many respects; the applicant is presently preparing additional information.

In North Carolina, SCA is in the preliminary stages of developing plans for a chemical treatment facility. Also, the state has a proposal before the legislature to authorize siting of a secure chemical landfill. If that is not acted on this session, it is likely to come up in the 1985 session.

Eastern Resource Technologies proposed a landfill in Maryland; however, the application was denied because of "inherent site deficiencies".

Importance of Regional Monitoring of Hazardous Waste Management

In a continuous effort to understand the regional impact of waste management and new treatment capacity, the Commission has been active in the formation and operation of the Consortium of State Hazardous Waste Siting Authorities. Siting authorities from various states meet regularly to discuss topics of mutual concern, share information, and standardize data.

Information is shared between states via the Consortium's newsletter as well as through informal contacts. The Commission is directly involved in the Mid-Atlantic Chapter of the Consortium which includes Maryland, New Jersey, New York, Ohio, and Pennsylvania.

Conclusions

The direct implications for New Jersey are as follows:

1. The trend to restrict the landfill disposal of certain wastes, particularly organic wastes, continues; what remains unclear is how severe these restrictions will eventually become.

2. Landfill capacity has declined somewhat over the past two years with the closure of five facilities in Pennsylvania and Maryland; however, several facilities continue to operate and have been able to accommodate new waste shipments.

3. The landfill facilities that are currently receiving wastes from New Jersey will most likely remain open; however, the potential for (a) forced closure because of ground water contamination at older cells which were not designed by state-of-the-art standards, or (b) inability to gain approval for expanded capacity upon depletion of permitted cells makes the long-term prospects uncertain.

4. There are several proposals by private companies to develop incineration, treatment, and landfill facilities in other states, and proposals involving incineration and treatment have progressed much further than those featuring landfill disposal.

5. The incineration facility proposals in Ohio and Kentucky have advanced quite far and collectively represent a measurable amount of new capacity for wastes currently accepted at the Rollins facility in Bridgeport; this geographic area now accounts for about ten percent of the wastes handled at Rollins.

SUMMARY OF ADDITIONAL DEMAND FOR COMMERCIAL FACILITIES

The primary objective of Chapter Three is to project for 1988 the waste types and quantities not included in Chapter Two that will require treatment or disposal in commercial facilities. Table 4-12 presents a summary of these wastes as estimated in previous sections. Total projected additional demand equals 121,000 tons. This represents a 28 percent

TABLE 4-12

1988 PROJECTED ADDITIONAL NEW JERSEY DEMAND FOR COMMERCIAL FACILITIES IN NEW JERSEY
(In Thousands of Tons)

Treatability Categories	Site Cleanups[1]	Shift From On-Site Facilities	Shift From Waste Burning in Boilers	Compliance with Effluent Regulations	Total Projections
AQUEOUS LIQUID					
Inorganic	--	1		--	1
Organic	6	1		<1	7
SOLVENTS					
Halogenated	--	--	--	--	--
Non-Halogenated	--	--	--	--	--
Mixed	--	--	--	--	--
Solvents, N.O.S.	--	--	--	--	--
OILS					
Automobile	--	--	--	--	--
Industrial	--	--	--	3	3
Fuel	--	--	--	--	--
Oils, N.O.S.	2	--	--	--	2
OTHER LIQUIDS					
Combustible	4	--	9	--	13
With Toxic Organics	4	--	--	--	4
SOLIDS AND SLUDGES					
Combustible Sludges	6	--	--	--	6
Heavy Metal Sludges	--	--	--	22	22
Corrosive Sludges	--	--	--	1	1
Wastes, N.O.S.	56	--	--	6	62
TOTALS	78	2	9	32[1]	121[2]

[1] Total here does not match the total in Table 4-10 (estimates of waste from pretreatment) due to rounding to thousands of tons. The quantity of 32,000 tons is retained throughout the rest of this Plan.

[2] In addition to the 431,000 projected in Chapter Two.

increase over the Chapter Two projected manifest quantity of 431,000 tons. Total projected demand for off-site commercial facilities, therefore, equals 552,000 tons of waste for 1988.

Site cleanup waste contributes 64 percent of the additional 121,000 tons, of which 56,000 tons cannot be definitively described further than miscellaneous solids and sludges.

A small amount of waste, about 2,000 tons, is expected to shift to the commercial market from on-site facility closures. These will be aqueous waste streams. About 9,000 tons of combustible liquids should shift due to stricter regulations on burning wastes and waste-derived fuels in industrial boilers.

Compliance with effluent regulations should generate 32,000 additional tons of waste by 1988, or 26 percent of the expected additional demand. The majority of that waste will be heavy metal sludges.

In comparison with the quantities projected from the manifest data base, the combined effects of these increases result in negligible increases in aqueous waste, waste solvents, and waste oils. Other liquid wastes increase about 65 percent overall, combustible liquids increasing by 62 percent and toxic organic liquids doubling. Solids and sludges as a group more than double as the original projection of 78,000 tons increases by 91,000 tons to equal 169,000 tons. Individually, the heavy metal category will increase 260 percent and the combustible category treble.

Table 4-13 combines the Chapter Two and Chapter Four quantities by treatability categories. The 62,000 tons of solid and sludge wastes, N.O.S. are prorated among the other types of solids and sludges in the same ratio as used in Chapter Two.

TABLE 4-13

1988 PROJECTED DEMAND FOR COMMERCIAL FACILITIES IN NEW JERSEY
(In Thousands of Tons)

Treatability Codes	1988 Projected Demand from Manifest Data (from Task One)	1988 Additional Projected Demand (from Task Three)	1988 Total Projected Demand
AQUEOUS LIQUIDS			
Inorganic	111	1	112
Organic	104	7	111
SOLVENTS			
Halogenated	10	--	10
Non-Halogenated	7	--	7
Solvents, N.O.S.	16	--	16
OILS			
Automobile	32	--	32
Industrial	30	3	33
Fuel	9	--	9
Oils, N.O.S.	2	2	4
OTHER LIQUIDS			
Combustible	21	13	34
Toxic with metals	1	--	1
Reactive	1	--	1
Corrosive	<1	--	<1
Toxic with organics	3	4	7
SOLIDS AND SLUDGES			
Heavy Metals	27	44	71
Oily	13	10	23
Paint	2	1	3
Combustible	4	9	13
Corrosive	3	3	6
Reactive	1	1	2
Organic	27	22	49
Other	1	1	2
UNEXAMINED	6		6
TOTAL	431	121[1]	552

1 121,000 tons for additional projected demand is retained throughout the remainder of this Plan. See Table 4-12.

CHAPTER FIVE

TRANSPORTATION ANALYSIS

OBJECTIVE

Chapter Five of the Plan examines the dynamics of hazardous waste transportation. It delineates the primary routes used and estimates the quantity of manifested waste transported in and among five multi-county regions in New Jersey. It defines the major points of entry and exit for interstate manifested waste shipments.

This Chapter also analyzes waste transportation costs. It examines how costs are typically calculated, the variability among costs for different types of carriers (nationwide waste carriers, local waste carriers, common carriers), and the impact of ICC deregulation.

Finally, Chapter Five briefly evaluates the significance that transportation distance and cost can have on a generator's choice of hazardous waste facilities. Chapter Six of this Plan uses the information contained herein to provide an assessment of the factors guiding these generators' decisions.

TRAFFIC

Hazardous Waste Transporters

All hazardous waste transporters are required to register annually with the New Jersey Department of Environmental Protection (DEP). There were 1,080 registered hazardous waste transporters in 1983.[1]

Transporters are required to comply with Section 7:26-7.5 of the state's hazardous waste regulations. These regulations include licensing requirements, transporters' manifest obligations, and requirements for emergency procedures.

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1 Computer listings which identify hazardous waste generators, transporters, and treatment, storage, or disposal facilities in New Jersey are available at the Commission office. Due to the length of these listings, they have not been included in the text of this Facilities Plan.

Major Intrastate Routes

Figure 5-1 presents a map of New Jersey sectored into the following five multi-county regions.

New Jersey Region	Counties
I - Northwest	Sussex, Warren, Morris, Hunterdon, Somerset
II - Northeast	Passaic, Bergen, Union, Hudson, Essex
III - Central	Mercer, Middlesex, Monmouth
IV - Southwest	Burlington, Camden, Gloucester, Salem
V - Southeast	Ocean, Atlantic, Cumberland, Cape May

Delineated on that map are the primary routes used for transporting waste in and among the five regions. Table 5-1 also shows the primary connecting routes among regions. These routes were determined by surveying several New Jersey-registered hazardous waste transporters located in New Jersey and other states regarding the routes most often used when traveling in the five regions.[2] Transporters reported that they frequently use numbered highways -- i.e., interstate, U.S., state, and county -- since restrictions on these highways such as traffic lights and limited-weight bridges are infrequent. Although no numbered routes in New Jersey carry restrictions specifically regarding the transport of hazardous waste, the New Jersey Department of Transportation does recommend that hazardous materials and wastes be hauled over routes removed from population centers.

Manifested Waste Quantities Transported Over New Jersey Roads

Figure 5-2 shows five regional maps, each describing the estimated quantity of manifested hazardous waste transported in the following cases:

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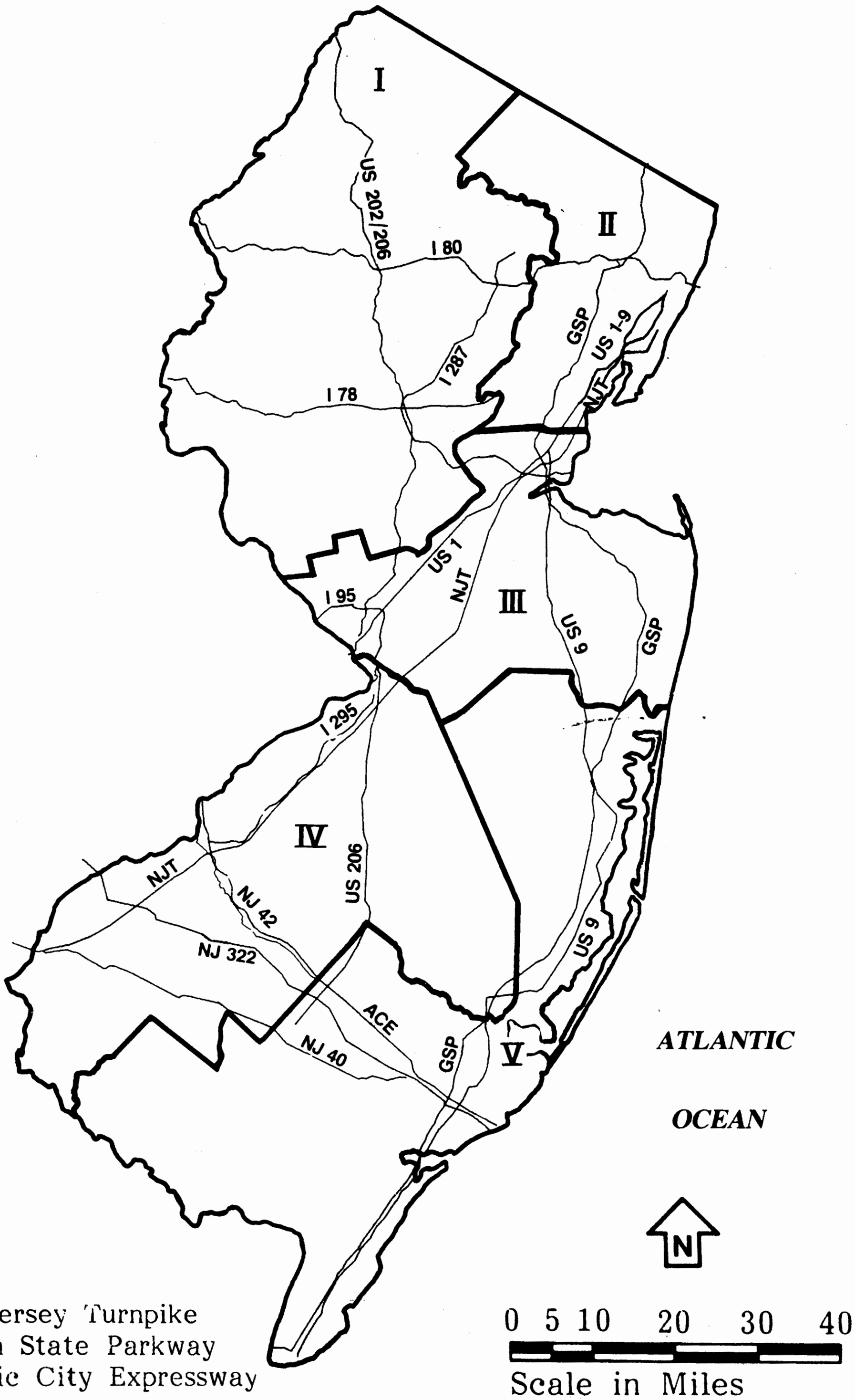
2 Appendix B contains a list of the transporters surveyed and the questions asked.

Figure 5-1
Primary Routes For Hazardous Waste Transportation*



KEY

NJT = New Jersey Turnpike
GSP = Garden State Parkway
ACE = Atlantic City Expressway

*As determined by interviews with New Jersey transporters.

TABLE 5-1

PRIMARY WASTE TRANSPORTATION ROUTES THROUGHOUT NEW JERSEY[1]

To	From: I Northwest	II Northeast	III Central	IV Southwest	V Southeast
I. Northwest	US 202/206 I-78 I-287	I-78 to US 9 I-80 to US 9 US 206 to US 9	I-287 I-78 to US 202/206	US 202/206 NJT	US 202/206 to I-78 to U[illegible]
II. Northeast	I-78 to US 9 I-80 to US 9 US 202/206 to US 9	US 1 US 9 I-287	US 1 US 9 I-287	NJT US 1	US 9 to I-28[illegible]
III. Central	I-287 US 202/206	US 1 US 9 I-287	US 1 US 9 NJT	NJT	GSP US 9
IV. Southwest	I-295 to US 202/206	NJT to US 1	NJT	I-295 US 322 NJ Rt 130	NJ Rt 322 US 40
V. Southeast	US 322 to to ACE to I-295 to US 202/206	GSP US 9 to	GSP US 9	NJ Rt 322 US 40	GSP NJ Rt 322 ACE US 40

1 As determined by telephone survey of registered transporters.

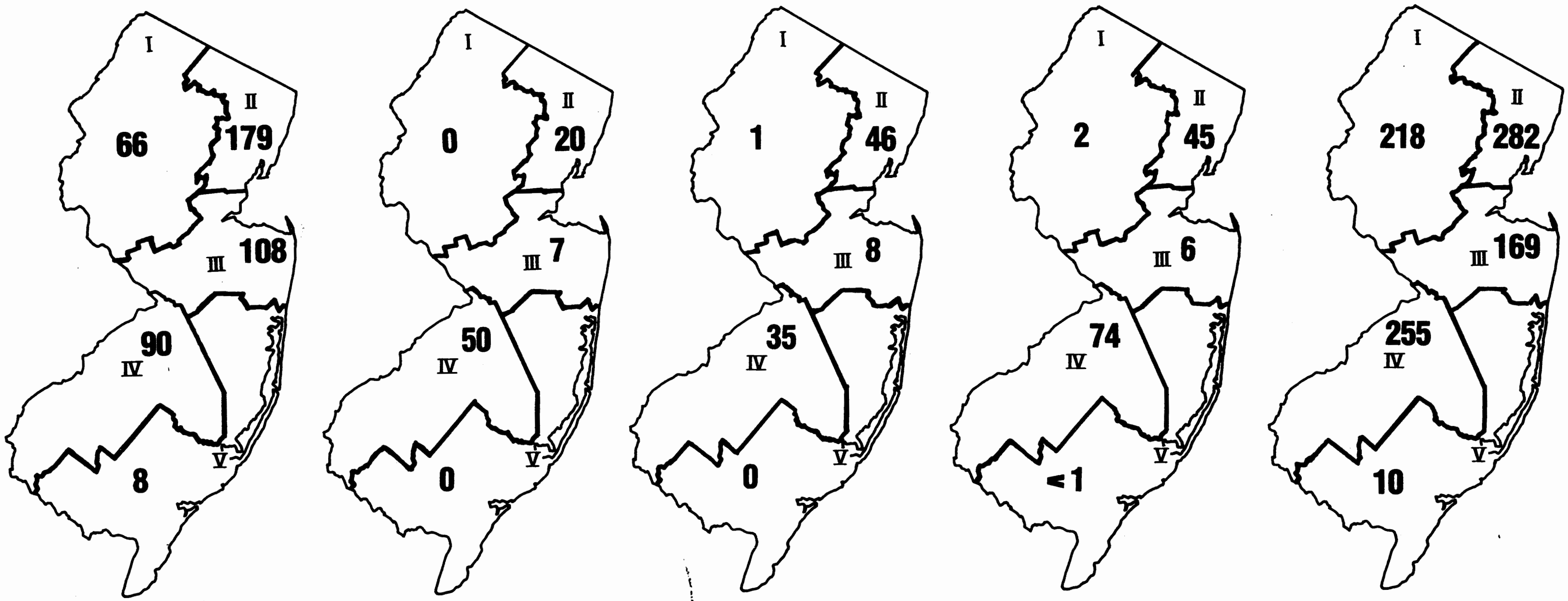
Abbreviations:

NJT - New Jersey Turnpike

GSP - Garden State Parkway. All truck traffic prohibited above Exit 105 (Eatontown) in Monmouth County.

ACE - Atlantic City Expressway

Figure 5-2
New Jersey Regional Manifested Waste Handling Statistics (In Thousands of 1982 Tons)



Map A
Manifested Waste Generated in Region

Map B
Manifested Waste Accepted at Regional Comercial Facilities From Same Region

Map C
Manifested Waste Accepted at Regional Comercial Facilities From Other New Jersey Regions

Map D
Manifested Waste Accepted at Regional Comercial Facilities From Other States

Map E
Total Estimated Manifested Waste Transferred Through Region From In-State & Out-of-State Generators

N

0 25 50
Scale in Miles

Map A	Waste generated by industries in the region and manifested for off-site management at any commercial facility, either in New Jersey or out of state
Map B	Waste accepted at commercial facilities in the region from the same region's generators only
Map C	Waste accepted at commercial facilities in the region from other New Jersey region's generators
Map D	Waste accepted at commercial facilities in the region from other states' generators
Map E	Total waste transported within or through the region, either from the region's or other generators, to the region's commercial facilities or to other regions' commercial facilities

Table 5-2 presents the same estimated quantities in chart form.

Major Interstate Points of Entry/Exit for Imported/Exported Manifested Wastes

States involved in interstate transportation of manifested hazardous waste with New Jersey were divided into three multi-state groupings:

Multi-State Grouping	Included States
North	Eastern NY, all New England
Midwest	Western and central NY, northern PA, OH, IL, IN, MI, MO, WI
South	Southern PA, MD, DE, VA, NC, SC, AL, KY, WV, GA

Figure 5-3 displays the major points of entry and exit to the three multi-state groupings. It shows for each multi-state grouping estimated quantities of manifested waste imported

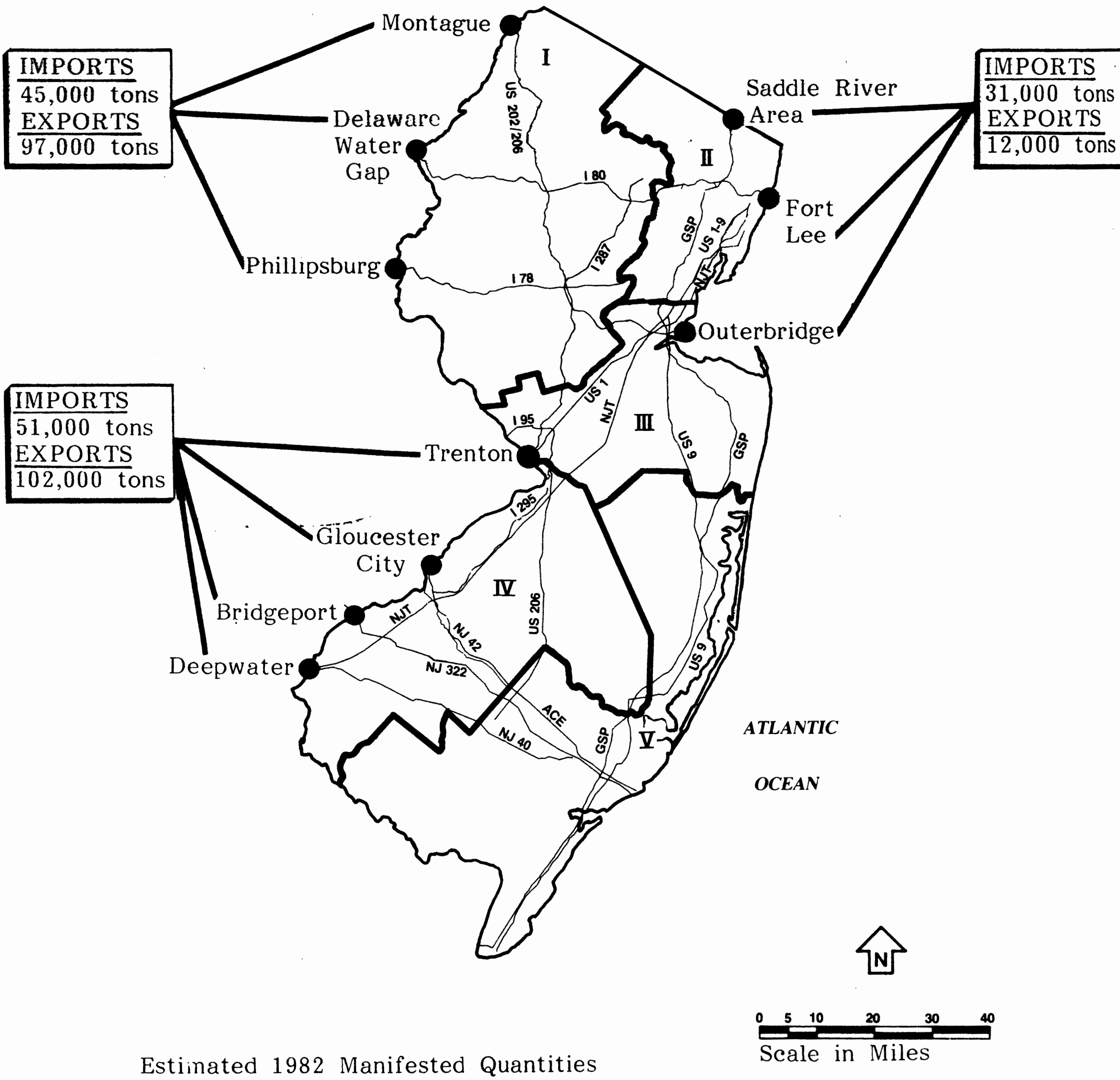
TABLE 5-2

NEW JERSEY 1982 REGIONAL MANIFESTED WASTE HANDLING STATISTICS
(in thousands of tons)

New Jersey Region	Manifested Waste Generated in Region	Manifested Wastes Accepted at Commercial Facilities in Region			Total Estimated Manifested Waste Transferred Through Region[1]
		From Same Region	From Other New Jersey Regions	From Other States	
I. Northwest	66	0	1	2	218
II. Northeast	179	20	46	45	282
III. Central	108	7	8	6	169
IV. Southwest	90	50	35	74	255
V. Southeast	8	0	0	<1	10

1 From generators, to commercial facilities in region, or enroute to other regions.

Figure 5-3
Major Points of Entry/Exit For Imported & Exported Waste



Estimated 1982 Manifested Quantities

KEY

NJT = New Jersey Turnpike
GSP = Garden State Parkway
ACE = Atlantic City Expressway

from and exported to New Jersey. Major points of entry/exit and quantities for New Jersey imports and exports are also shown in chart form below.

TABLE 5-3

MAJOR INTERSTATE ENTRY/EXIT POINTS
AND IMPORT/EXPORT MANIFESTED QUANTITIES
(quantities in thousands of 1982 tons)

Multi-State Region	Major Points of Entry/Exit	Manifested Imports to New Jersey	Manifested Exports From New Jersey
North	Saddle River Area Fort Lee Outerbridge	31	12
Midwest	Montague Delaware Water Gap Phillipsburg	45	97
South	Trenton Gloucester City Bridgeport Deepwater	51	102

TRANSPORTATION COSTS

Typical Costs

Tables 5-4 and 5-5 estimate capital investment, fixed annual, and per mile costs for transportation of bulk liquid wastes (Table 5-4) and drummed wastes (Table 5-5). They show average one-way trip times and how transporters typically calculate the costs of their services. The estimated capital, fixed, and variable annual costs used were verified with hazardous waste transporters.

The comparative costs for bulk liquid and drummed waste over distances of 50, 100, and 500 miles are repeated below:

TABLE 5-4

BULK WASTE TRANSPORTATION COSTS
5,000-GALLON VACUUM TRAILER

Item		
Capital Costs		
Tractor (power unit)	$55,000	
Vacuum trailer (5,000 gallons)	35,000	
	$90,000	
Daily Capital Charge		$88.00[1]
Other Fixed Annual Costs		
Labor overhead (@ 35% annual labor salary of $22,000)	$ 7,700	
Labor supervision (@ 20% annual labor salary of $22,000)	4,400	
Insurance and taxes	4,500	
Permits	2,000	
General and administrative (@ 10% other fixed annual costs)	1,900	
	$20,500	
Daily Proration of Other Fixed Annual Costs		$82.00
Daily Labor Rate (@ $22,000/yr, $11/hr)		$88.00
Per Mile Charges		
Fuel (3.8 mpg @ $1.30/gal)	$0.34/mi	
Tires (estimate)	0.10/mi	
Maintenance (estimate)	0.10/mi	
General and administrative (10% of per mile charges)	0.05/mi	
	$0.59/mi	

One-Way Distance in Miles	One-Way Driving Time (hrs)	Loading/ Unloading Time	One-Way Layover Time	Cost Per Mile
50	2	2	--	$3.95[2]
100	3	2	--	$3.17
500	13	2	8	$2.41[3]

1 Assumes 12% interest, 8 years operating life, 250 operating days per year.

2 Assumes daily capital charges and daily proration of other fixed costs charges at 60% daily rate. 10% premium paid since a second 50-mile run cannot be made in the same day. The size of actual premium charged by the transporter depends on frequency of customers' business and whether a second shorter trip can be scheduled or loss of road miles made up by using truck for other activities, e.g., maintenance.

3 Truck in use for 2 days. Includes charges for driver's overtime and personal expenses.

TABLE 5-5

DRUMMED WASTE TRANSPORTATION COSTS
80 DRUMS ON FLAT BED TRAILER

Item		
Capital Costs		
Tractor (power unit)	$55,000	
Flat bed trailer	25,000	
	$80,000	
Daily Capital Charges		$80.00[1]
Other Fixed Annual Costs		
Labor overhead (@ 35% annual labor salary of $22,000)	$ 7,700	
Labor Supervision (@ 20% of annual labor salary of $22,000)	4,400	
Insurance and taxes	4,500	
Permits	2,000	
General and administrative (@ 10% other fixed annual costs)	1,900	
	$20,500	
Daily Proration of Other Fixed Annual Costs		$82.00
Daily Labor Rate (@ $22,000/yr, $11/hr)		$88.00
Per Mile Charges		
Fuel charges (4.5 mpg @ $1.30/gal	$0.22/mi	
Tires (estimate)	0.10/mi	
Maintenance (estimate)	0.10/mi	
General and administrative (@ 10% FAC)	0.04/mi	
	$0.46/mi	

One-Way Distance in Miles	One-Way Driving Time (hrs)	Loading/ Unloading Time	One-Way Layover Time	Cost Per Mile
50	2	3	--	$5.20[2]
100	3	3	--	$3.92
500	13	3	8	$2.94[3]

1 Assumes 12% interest, 8 years operating life, 250 operating days per year.
2 Assumes Daily Capital Charges and Daily Proration of Other Fixed Charges at full daily rate. Scheduling the flat bed truck for other drum work is much less likely than scheduling a vacuum trailer for other bulk work because of the lesser availability of drum work and the availability of smaller, less expensive vehicles to handle a small number of drums.
3 Truck in use for 2 days. Includes charges for driver's overtime and personal expenses.

One-Way Distance	Bulk Liquids: Unit Cost	Bulk Liquids: Total Transportation Cost for Truckload (20 tons)	Drums: Unit Cost	Drums: Total Transportation Cost for Truckload (18 tons)
50 miles	$3.95/mi	$ 198	$5.20/mi	$ 260
100 miles	$3.17/mi	$ 317	$3.92/mi	$ 392
500 miles	$2.41/mi	$1,205	$2.94/mi	$1,470

Regarding liquid waste transported in bulk form, fifty-mile (one-way) distances have the highest per mile cost because a premium is usually paid by the customer for employing a truck less than a full day and the driver's wages are distributed over fewer miles for the time involved. Five hundred mile (one-way) distances result in the lowest per mile cost because longer distances can take advantage of more efficient driving time and other economies of scale. Even counting DOT-required non-driving time for the driver and overtime rates, a 500-mile trip only employs equipment for two days.

Drum transportation costs are higher than those for bulk liquid for like distances due mostly to the additional time and effort required to load drums. Eighty drums equal a full truckload and each drum must be loaded individually.

Survey of Costs

The consultant contacted fourteen hazardous waste haulers to verify the calculated typical costs. The haulers interviewed were of three types: (1) nationwide waste carriers, (2) local waste carriers, and (3) common carriers. An average of the loaded truck-mile costs reported are summarized below:

LOADED TRUCK-MILE COSTS

Type of Waste Transporter Interviewed	Bulk, One-Way Distance			Drummed, One-Way Distance		
	50 mi	100 mi	500 mi	50 mi	100 mi	500 mi
Nationwide Waste Carrier	$3.42	$3.00	$2.50	$6.00	$4.00	$2.70
Local Waste Carrier	$4.50	$3.00	$2.40	$5.00	$3.50	$2.90
Common Carrier	$3.04	$2.40	$2.26	$6.64	$4.20	$2.62
Consultant's Estimate	$3.95	$3.17	$2.41	$5.20	$3.92	$2.94

Local waste carrier costs for fifty-mile, one-way distances tend to be higher because of the need to charge higher premiums for use of a truck less than a full day. Having a smaller network of customers and generally smaller businesses overall, higher premiums are necessary to recover the costs of the capital equipment. Local waste carriers, however, offer lower costs for drum transportation for shorter distances. Drummed waste reportedly constitutes a greater portion of their business. Their familiarity with their own local markets allows them to develop greater coordination in the management and transport of containers.

Effect of Deregulation

The present cost differential between nationwide waste carriers and common carriers is not quite so great as it was immediately following the Interstate Commerce Commission's August 1982 so-called "deregulation". Initially, the ICC's declaratory order that hazardous waste of no economic value destined for disposal was outside its jurisdiction tripled the amount of equipment available for waste transport and introduced a new pricing system.[3] However, since that time, many common carriers unsophisticated in the transportation of hazardous waste have left the market, while others have undergone training to comply with previously unfamiliar regulations and have consequently raised their prices above

3 Common carriers typically bill customers according to the standard tariff established for commodity transportation.

the standard tariff to reflect those additional costs. This has caused prices to stabilize closer to their pre-deregulation levels.

SIGNIFICANCE OF TRANSPORTATION IN GENERATORS' WASTE MANAGEMENT DECISIONS

Composite Transportation - Commercial Facility Costs

Table 5-6 displays the costs for various hazardous waste treatment/disposal methods plus transportation at distances of 50, 100, and 500 miles from New Jersey. Costs are given for both bulk wastes and drums. This table presents transportation costs in the only appropriate form for accurate evaluation -- together with the costs for the waste treatment or disposal method selected.

Table 5-7 shows that transportation costs form a small part of total incineration costs but a large part of aqueous waste treatment costs. This supports the Chapter Three findings that aqueous treatment facilities in New Jersey receive most of their waste from nearby generators. In contrast, the Rollins incineration facility received waste from generators in 21 states. Given the present variability among prices charged by different types of commercial facilities (and to a lesser extent by different facilities of the same type), generators have long since stopped assuming that facilities located considerable distances from their plants were "too expensive" by virtue of the transportation costs.

Figure 5-4 shows the out-of-state commercial facilities currently receiving large quantities of non-aqueous New Jersey waste. The most frequently utilized out-of-state commercial facilities by type, other than aqueous treatment facilities, are landfills. Cement kilns and incinerators are the second and third most frequently utilized facilities by type, respectively.

TABLE 5-6

TOTAL HAZARDOUS WASTE MANAGEMENT COSTS

	Bulk (20 tons)			Drummed (18 tons)		
	50 miles	100 miles	500 miles	50 miles	100 miles	500 miles
Landfill:						
Bulk @ $60/ton*	$ 1,400	$ 1,500	$ 2,400	X	X	X
Drums @ $150/ton*	X	X	X	$ 3,000	$ 3,100	$ 4,200
Incineration:						
Liquid @ $150/ton*	$ 3,200	$ 3,300	$ 4,200	$ 3,000	$ 3,100	$ 4,200
Solid and Very Toxic Liquids @ $600/ton	$12,200	$12,300	$13,200	$11,000	$11,200	$12,200
Aqueous Waste Treatment:						
@ $25/ton*	$ 700	$ 800	$ 1,700	$ 700	$ 800	$ 1,900

* Typical costs provided for purposes of analysis; actual costs range considerably. Source: Booz-Allen and Hamilton, Inc. 1982 report on <u>Commercial Hazardous Waste Management Industry</u>, prepared for U.S. EPA Office of Policy Analysis.

TABLE 5-7

TRANSPORTATION COST AS PERCENT OF
WASTE MANAGEMENT COSTS IN TABLE 5-6

	Bulk (20 tons)			Drummed (18 tons)		
	50 miles	100 miles	500 miles	50 miles	100 miles	500 miles
Landfill:						
Bulk @ $60/ton*	14%	20%	50%	X	X	X
Drums @ $150/ton*	X	X	X	10%	13%	36%
Incineration:						
Liquid @ $150/ton*	6%	9%	29%	10%	13%	36%
Solid and Very Toxic Liquids @ $600/ton*	2%	2%	9%	3%	4%	12%
Aqueous Waste Treatment: @ $25/ton*	29%	38%	71%	43%	50%	79%

* Typical costs provided for purposes of analysis; actual costs range considerably. Source: Booz-Allen and Hamilton, Inc. 1982 report on Commercial Hazardous Waste Management Industry, prepared for U.S. EPA Office of Policy Analysis.

Importance of Costs in Selecting Facilities

A survey of generators prepared for the Delaware River Basin Commission and the New Jersey DEP[4] examined the importance of economic factors in selecting off-site facilities. The study reported that costs of transportation and disposal are important, but second to potential future liability posed by a facility to the generator. In other words, the generator first screened candidate facilities against selected risk criteria; facilities deemed to pose an acceptable risk were then evaluated with regard to total cost of transportation and disposal.

That 1980 report suggested that placing liability considerations before direct costs would become more widespread among generators after the implementation of RCRA. This has proven true for the most part. Transporters who, as part of their services, broker disposal/treatment facilities for their customers reported that generators are increasingly asking for the regulatory status and compliance information of the suggested facilities, not only the facilities' prices.

Some generators have wastes which can either be incinerated or disposed in landfills. For generators that consider the liability of incineration and landfill disposal to be about equal for their waste, the decision on which facility to use is clear. The difference between $4,200 to landfill drummed solids 500 miles away and $12,000 to incinerate solids 50 miles away is quite compelling. The fact that $1,500 of the landfilling cost is transportation is not considered in isolation.

The cost differential between landfills and higher treatment technologies certainly applies to existing landfills. The prices charged to customers by new landfills are likely to be higher than those charged by existing ones. New landfills will encounter higher capital investment costs, which will be passed along to the customer in the form of higher prices. Thus, it is possible that new landfills located closer to some generators but having a greater disposal price than those of existing landfills will not get the generators' waste; the new landfill's overall price including transportation will still

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4 "Importance of Economic Factors to Onsite-Offsite Hazardous Waste Management Decisions." Prepared by Booz-Allen and Hamilton, Inc. under subcontract to Environmental Resources Management, Inc. January 1980.

be higher. This seemingly was the case in Maryland, where a state authority recently opened a hazardous waste landfill which is now closed because of low business volume.

Chapter Six, which predicts the new commercial facility capacity necessary to meet New Jersey's needs, will consider the information presented in this Chapter to develop more definitive conclusions on factors influencing generators' waste management decisions.

CHAPTER SIX

NEW FACILITIES NEEDED BY NEW JERSEY

OBJECTIVE

Shortfall Between Supply and Demand

This Chapter defines the new facilities needed in New Jersey. One of the important considerations is the shortfall between "supply" (the capacity of existing commercial facilities) and "demand" (the future quantity of waste expected to be manifested).

Supply

It is assumed, as explained in Chapter Three, that the majority of existing commercial facilities in New Jersey will continue in operation and will continue to receive, in 1988, the same quantity of waste from other states as in 1983. That is, the "supply" of available capacity for managing New Jersey waste equals the existing capacity less that portion used for waste from other states. This allows for accommodation of some imports without allotting extensive New Jersey capacity to out-of-state waste. Facilities in other states will likely handle some New Jersey waste upon occasion.

Demand

"Demand" is equal to the 1988 projections of currently manifested waste (Chapter Two) plus the previously non-manifested waste which is expected to shift off site in 1988 (Chapter Four).[1] That is, all waste expected to be manifested by New Jersey generators, including that currently being exported, will serve as demand for New Jersey capacity. This reflects a goal that New Jersey should manage waste from its industry without undue reliance on facilities in other states.

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1 Imports are not included in the definition of demand as the supply of available capacity was decreased to account for that waste.

Alternative Cases

To better understand the alternatives for managing hazardous waste in New Jersey, the Commission selected three alternative cases for analysis:

1. Market-Driven Case - Wastes are assigned to technologies essentially based on how wastes would be managed in the free market, i.e., the generators' assessments of risk and cost of regulatorily permitted management methods.

2. Maximum Treatment Case - Wastes are assigned to technologies in accordance with the Commission's proposed waste management hierarchy:

   a. technologies that recover the materials in the waste for reuse;

   b. technologies that recover the energy value of the waste;

   c. technologies that totally destroy the hazardous portion of the waste;

   d. technologies that decrease the volume and/or hazard of the waste; and

   e. technologies that isolate the waste from the environment.

3. Maximum Use of Non-Commercial Capacity - Wastes that cannot be accommodated by existing New Jersey commercial facilities are assigned to existing excess on-site, non-commercial New Jersey facilities based on estimates of such excess capacity in the same manner as the market-driven case.

For each case, this Chapter examines: (a) capacity shortfalls, (b) cost to New Jersey generators, (c) the conformity of the specified technologies with the legislative mandate of the Commission, and (d) the prospects for private development of the needed facilities.

ASSIGNMENT OF WASTES TO TECHNOLOGIES

Total Demand

Table 6-1 shows total demand for commercial facilities, organized by waste type and expressed as the sum of the 1988 projections from Chapters Two and Four. This table includes:

- Projections of normalized waste manifested in 1981, 1982, and 1983, accounting for economic recovery/growth and source reduction.

- Projections of previously non-manifested waste to reflect cleanup of contaminated sites, reduced burning of waste in on-site boilers, implementation of pretreatment standards and effluent limitations for industrial wastewater, and closure of on-site facilities.

It should be noted that the 62,000 tons of solids and sludges, N.O.S. projected in Chapter Four are prorated among the other types of solids and sludges in the same ratio as projected in Chapter Two.

Summary of Waste Assignments

The assignment of waste types to appropriate technologies for the alternative cases is summarized in Table 6-2. The summary uses the existing waste management pattern as a basis, showing how the alternative cases depart from the technologies used by New Jersey generators in 1983. The assignment to technologies for the case which makes maximum use of non-commercial capacity is the same as for the market-driven case.

MARKET-DRIVEN WASTE ASSIGNMENTS

Table 6-3 shows the assignment of waste quantities by type to technologies under the market-driven case. The assignment closely follows the 1983 distribution, which reflects generators' selection of alternatives which they believe best met their needs in 1983 in terms of cost, risks, and liabilities. Thus, the market-driven case is the best reflection of how wastes would be handled in the free market.

TABLE 6-2 (continued)

Waste Type	Typical Management Methods Used By Generators in 1983	Selected Market-Driven Management Methods	Selected Maximum Treatment Management Methods
SLUDGES AND SOLIDS (continued)			
Combustible sludges and solids	Incineration Cement kiln	Incineration	Incineration
Corrosive sludges and solids	Landfill	Landfill	(8) 5% - Aqueous treatment 95% - Landfill
Reactive sludges and solids	Landfill	Landfill	Advanced thermal destruction
Sludges and Solids with organics	Landfill	Land treatment Incineration Landfill	(9) 80% - Incineration 10% - Advanced thermal destruction with solvent extraction 10% - Landfill
Sludges and Solids, N.O.S.	Landfill	Landfill	Landfill with stabilization
UNEXAMINED	--	Aqueous treatment Incineration Landfill	Aqueous treatment Incineration Landfill

TABLE 6-2 (continued)

FOOTNOTES

(1) Based on the assumption that 10 percent of the aqueous organic wastes will have organics at a concentration too high for biological aqueous treatment yet too low for conventional incineration and/or the waste constituents inhibit biological treatment. These wastes are candidates for advanced thermal destruction.

(2) Based on the following assumptions about automobile oils: 90 percent high enough quality to be recovered for lubricating value; 5 percent mixed or otherwise non-recoverable (can be blended for fuel); 5 percent contain large amounts of water or toxic contaminants preventing use as fuel (must be incinerated).

(3) Based on the following assumptions about industrial oils: 25 percent too contaminated even for use as fuel (requires incineration); 25 percent mixed, contaminated, or otherwise rendered non-recoverable (can be blended for fuel); 50 percent high enough quality to be recovered for lubricating value.

(4) Same distribution as industrial oils (see (3) above).

(5) Based on approximate 1983 distribution of combustible liquids: less than 1 percent halogenated solvents (25 percent recoverable/75 percent require incineration); 28 percent non-halogenated solvents (25 percent recoverable/25 percent blended for fuel/50 percent require incineration); 71 percent listed as ignitible liquid (50 percent blended for fuel/50 percent require incineration) or other combustible liquids (20 percent can be blended for fuels/80 percent must be incinerated).

(6) Based on approximate 1983 distribution of heavy metal solids and sludges: 23 percent heavy metal sludges (43 percent from fabricated metals, electrical machinery, and transportation equipment industries -- most likely from electroplating or metal finishing operations [25 percent with segregated streams that can go to a central metals recovery facility/75 percent with mixed metal sludges that must be landfilled]/57 percent from other industries [must be landfilled]); 77 percent solids with metals (15 percent from steel production furnaces [all currently

going to pyrometallurgical metal recovery]/43 percent solids with lead [assume 10 percent can go to pyrometallurgical metal recovery/90 percent must be landfilled]/ 42 percent other solids with metals [must be landfilled]).

Additional quantities of heavy metal sludges can be expected in 1988 from two sources. First, 22,000 tons of sludges from the pretreatment of industrial wastewaters can be expected. Approximately 10 percent of this is from electroplating and metal finishing wastewaters and can go to a central metals recovery facility. The remainder requires landfilling. Second, 22,000 tons of sludges with metals will come from cleanup of abandoned sites -- all of this must be landfilled.

The total breakdown is then: 10 percent amenable to metal recovery/90 percent must be landfilled.

(7) Based on 1983 management of paint residues: 100 percent sludges (65 percent to landfills [assigned to incineration]; 35 percent sent for solvent recovery).

(8) Based on approximate 1983 distribution of corrosive sludges and solids: 5 percent sludges (can go to aqueous treatment)/95 percent solids (must be landfilled).

(9) Based on approximate 1983 distribution of sludges and solids with organics: 27 percent sludges (15 percent contaminated soils [require advanced thermal destruction to destroy organics]/85 percent other sludges that can be incinerated); 73 percent solids with organics (27 percent still bottoms, PCB wastes, or generally ignitible solids [that can be incinerated]/48 percent oily wastes such as oil spill cleanup waste or API separator sludges [can go to a land treatment facility but assumed to go to incineration, e.g., fluidized bed]/8 percent contaminated soils ([require advanced thermal destruction to destroy organics]/17 percent empty containers or unspecified solids [must be landfilled]).

TABLE 6-3

ASSIGNMENT OF PROJECTED 1988 MANIFESTED
NEW JERSEY WASTES - MARKET-DRIVEN CASE
(In Thousands of Tons)

	Materials Recovery		Energy Recovery	Treatment/Destruction			Disposal	
Waste Type	Solvent Recovery	Pyrometallurgical Metal Recovery	Fuel Blending	Aqueous Treatment	Incineration	Land Treatment	Stabilized Land Emplacement	Unstabilized Land Emplacement
AQUEOUS LIQUIDS								
Inorganic				112				
Organic				111				
SOLVENTS								
Halogenated	10							
Non-Halogenated	7							
Mixed								
Solvents, NOS	16							
OILS								
Automobile			32					
Industrial			33					
Fuel			9					
Oils, NOS			4					
OTHER LIQUIDS								
Combustible			22		12			
Toxic with Metals				1				
Reactive				1				
Corrosive				<1				
PCB Liquids					7			

TABLE 6-3 (continued)

Waste Type	Materials Recovery: Solvent Recovery	Materials Recovery: Pyrometallurgical Metal Recovery	Energy Recovery: Fuel Blending	Treatment/Destruction: Aqueous Treatment	Treatment/Destruction: Incineration	Treatment/Destruction: Land Treatment	Disposal: Stabilized Land Emplacement	Disposal: Unstabilized Land Emplacement
SLUDGES AND SOLIDS								
Heavy Metals		3					46	22
Oily			20			3		
Paint	1						2	
Combustible					13			
Corrosive								6
Reactive								2
Organics					7*	17		25
Other								2
UNEXAMINED				2	2			2
ADDITIONAL RESIDUALS					6		4	8
TOTAL	34	3	120	227	47	20	52	67

* Includes PCB wastes -- must go to a PCB-permitted incinerator.

treatment in this case. It is assumed that fifty percent of the 1983 aqueous waste identified in Chapter Three as going to "other" facilities was going to deep wells.

Wastes Sent to Cement Kilns

Four cement kilns currently accept wastes from New Jersey for burning as supplementary fuel. Since no cement kilns exist in New Jersey, these wastes are reassigned in this case to fuel blending and incineration facilities. In 1983, the combustible liquids going to cement kilns broke down in the following way: 1 percent contained halogenated compounds, 17 percent contained only non-halogenated compounds, and the halogen content of the remaining 82 percent was unknown. Non-halogenated wastes and low-concentration halogenated wastes can be blended for fuel. Wastes with a higher halogen content complicate fuel blending and must be incinerated.

It is assumed that none of the halogenated waste and 100 percent of the non-halogenated wastes are amenable to fuel blending. The wastes with undetermined halogen content are assumed to have the same halogenated to non-halogenated ratio (1:17) as the specified wastes and are assigned accordingly.

All of the oily waste that went to cement kilns in 1983, a relatively small amount, is assigned to fuel blending in this case.

Stabilization of Landfilled Wastes

Heavy metal solids and sludges generated by manufacturing industries are stabilized prior to landfilling in this case. Heavy metal solids and sludges expected to be generated from site cleanups and shipped to commercial facilities represent wastes for which stabilization is not appropriate. The estimates in Chapter Four of these site cleanup wastes exclude those wastes amenable to stabilization, since they would most likely be stabilized and managed on site. For this reason, heavy metal solids and sludges from site cleanups that are expected to represent new demand for off-site capacity are sent directly for land emplacement.

Paint residues assigned to land emplacement in this case are stabilized prior to disposal, although stabilization could be complicated by the presence of organic compounds. Finally, the additional incinerator ash from the burning of solvent recovery and fuel blending residuals is assumed to contain metals and, therefore, is stabilized prior to land emplacement.

Changes in Residual Quantities

Table 6-4 shows the change from 1983 to the 1988 market-driven case in waste quantities handled by new or existing New Jersey facilities. Table 6-4 also shows the resulting increase in the quantities of residuals from those facilities and their presumed distribution among subsequent management facilities. The distribution is based on the management method selected for these residuals by facility operators in 1983.

MAXIMUM TREATMENT CASE

The assignment of wastes to technologies under the maximum treatment case is based strictly on the characteristics of the wastes and the hierarchy of treatment technologies outlined in the previous section. Cost is not an important consideration, as it is with the market-driven case. Table 6-5 shows the assignment of 1988 manifested wastes to technologies in this case.

Where existing New Jersey facilities can manage a waste in the best applicable way, wastes will be assigned to those technologies. However, if the appropriate management method for a waste is a technology for which no facility exists in New Jersey, then that waste automatically represents demand for a facility of that type even if it is currently going to another type of facility in New Jersey.

New Technologies

Some technologies used in this case were discussed in Chapter Three but not used in the market-driven case. Three terms, advanced thermal destruction, central metals recovery, and waste oil re-refining, require further explanation.

Advanced Thermal Destruction

This category of treatment includes technologies which have the potential for greater destruction of organic constituents, or which are more appropriate for certain wastes, than conventional rotary kiln incineration. Such technologies

TABLE 6-4

ADDITIONAL RESIDUALS MANAGEMENT IN 1988
MARKET-DRIVEN CASE

Technology/ Facility	Additional Waste Handled in New Jersey In 1988 Over 1983 (tons)	Additional Residuals Generated (tons)	Selected Management Method for Residuals
Aqueous Treatment	88,000	4,400 (5%)[1]	Land Emplacement
Solvent Recovery	11,000	1,000 (9%)[2]	Incineration
Fuel Blending	45,000	4,500 (10%)[1]	Incineration
Incineration	38,000	7,600 (20%)[3]	Land Emplacement
Metal Recovery	3,000	0[4]	

1 Derived from Technical and Economic Analysis of Hazardous Waste Management Facilities, prepared by Environmental Resources Management, Inc. for Minnesota Waste Management Board, October 1983.

2 Based on 1983 manifested receipts and residual shipments by New Jersey solvent recovery facilities.

3 Based on manifested receipts and off-site shipments from Rollins incinerator for 1981, 1982, and 1983.

4 Residual produced is non-hazardous.

TABLE 6-5

ASSIGNMENT OF PROJECTED 1988 MANIFESTED
NEW JERSEY WASTES - MAXIMUM TREATMENT CASE
(In Thousands of Tons)

	Materials Recovery				Energy Recovery	Treatment/Destruction				Disposal	
Waste Type	Solvent Recovery	Oil Recovery	Ion Exchange Metals Recovery	Pyrometallurgical Metal Recovery	Fuel Blending	Aqueous Treatment	Incineration	Advanced Thermal Destruction	Land Treatment	Unstabilized Land Emplacement	Stabilized Land Emplacement
AQUEOUS LIQUIDS											
Inorganic						112					
Organic						100		11			
SOLVENTS											
Halogenated	10										
Non-Halogenated	7										
Mixed											
Solvents, NOS	16										
OILS											
Automobile		28			2		2				
Industrial		17			8		8				
Fuel					9						
Oils, NOS		2			1		1				
OTHER LIQUIDS											
Combustible	3				3		28				
Toxic with Metals						1					
Reactive											
Corrosive						<1		1			
PCB Liquids							7*				

TABLE 6-5 (continued)

	Materials Recovery				Energy Recovery	Treatment/Destruction				Disposal	
Waste Type	Solvent Recovery	Oil Recovery	Ion Exchange Metals Recovery	Pyrometallurgical Metal Recovery	Fuel Blending	Aqueous Treatment	Incineration	Advanced Thermal Destruction	Land Treatment	Unstabilized Land Emplacement	Stabilized Land Emplacement
SLUDGES AND SOLIDS											
Heavy Metals			3	4						22	42
Oily							23				
Paint	1						2				
Combustible							13				
Corrosive						<1				6	
Reactive								2			
Organics							39	5		5	
Other				<1							2
UNEXAMINED						2	2				2
ADDITIONAL RESIDUALS							6			6	24
TOTAL	37	47	3	4	23	215	131	19		39	70

* Includes PCB wastes -- must go to a PCB-permitted incinerator.

include supercritical water, plasma arc pyrolysis, molten salt destruction, wet air oxidation, and high-temperature fluid wall incineration. Most of these are still undergoing development, and their full potential is undefined. Rather than specifying a particular technology, the broader category "advanced thermal destruction" is used, since selecting a specific technology will require additional data beyond the scope of this study.

Ion Exchange Metals Recovery

Several areas of the country, including the New York City/New Jersey port area, are investigating the possibility of a central facility to recover the heavy metals that electroplaters and metal finishers will be required to remove from their wastewater discharges. Using such a facility would require segregating metal wastewater streams and placing ion exchange canisters in the generators' process lines. The ion exchange medium in the canisters pulls metals from the wastewater. Exhausted canisters are shipped to a central facility where the metals are recovered and the ion exchange medium regenerated.

Development of such a facility would require a large amount of cooperation among electroplaters and metal finishers but would greatly decrease the amount of heavy metal sludge generated from conventional pretreatment, as projected in Chapter Four. The New York Port Authority is currently considering financing the development of such a facility.

Waste Oil Re-Refining

Waste oil recovery leads to recovery of a product with lubricating value near or equivalent to the virgin material. It does not refer to the blending of oils as fuels. The acid/clay process for oil recovery is less popular now and the vacuum distillation process is more prevalent. However, a new commercial facility would likely combine several technologies under the general category of re-refining.

Waste Reassignments

Some wastes are assigned to different management methods in the maximum treatment case than they were in the market-driven case. These reassignments occur when a "higher" form of management (e.g., recovery of material versus recovery of energy value) exists for a waste but was not utilized in the market-driven case. These reassignments are described below.

Aqueous Wastes

In general, aqueous wastes have no recovery value and are successfully treated, either by neutralization, oxidation/reduction, biological treatment, or some other method, at aqueous treatment facilities. A small portion of aqueous organic wastes contain organics at a concentration which may interfere with biological treatment. Although they went to aqueous treatment facilities in 1983, these wastes have been assigned in this case to advanced thermal destruction, e.g., supercritical water, to assure destruction of the organic portion.

Oils

The RCRA amendments direct the U.S. EPA to promulgate standards governing the use of recycled oils. Though these new standards "[should] not discourage the recovery or recycling of waste oils", they will likely require some generators to change the methods used to handle waste oils. In 1983, almost all of these oils were blended for fuels.

The recoverability of oils is a function of the type of oil, the types of contaminants in the oil, the source, and the technology applied to reclaim the oil as a fuel. It is assumed that nearly all manifested automobile crankcase oil can be re-refined, with only small amounts requiring fuel blending or incineration. Waste industrial oils are of varied types including cutting and machining oils, cooling oils, lubricating oils, and others. Some of them are generated in significant quantities as unmixed, recoverable oils. Others are mixed with solvents or other oils, making recovery difficult. These oils do, however, have fairly high heating values and can be blended for fuels. Finally, some oils either have a low heating value or are contaminated with toxic metals or organics and must be incinerated. Waste fuel oils are simply blended into fuels in this case. Oils not otherwise specified are similar to industrial oils from the same sources and are handled in the same way.

recovery residuals, the residuals from the advanced thermal destruction of reactive wastes, and the residuals from a central metals recovery facility are stabilized in this case based on the possibility that they might contain heavy metals. It should be noted that more extensive stabilization of wastes sent to land emplacement facilities will result in a larger volume of waste requiring this type of facility.

Changes in Residual Quantities

Table 6-6 shows the change from 1983 to 1988 for this case in waste quantities handled by new or existing New Jersey facilities. Table 6-6 also shows the resulting increase in the quantities of residuals from those facilities and their presumed distribution among subsequent management facilities. The distribution is based on the same hierarchy of treatment described above.

COMPARISON OF THREE CASES

Capacity Shortfalls

Table 6-7 summarizes the available capacity of the existing types of New Jersey facilities after subtracting 1983 imports from the total capacities estimated in Chapter Three. Table 6-7 also shows the projected demand for capacity, i.e., the assignment of projected 1988 manifested wastes and additional residuals, for the market-driven and maximum treatment cases. As noted previously, the waste assignments for the market-driven case are the same as for the maximum use of non-commercial capacity case.

Market-Driven Case

Major needs for 1988 in this case include:

- A 25,000-ton per year incinerator that can handle liquids, sludges, and solids.
- A 120,000-ton per year land emplacement facility for stabilized and unstabilized waste with restrictions on organic wastes and liquids, integrated with a 52,000-ton per year stabilization facility.
- A 20,000-ton per year land treatment facility.

TABLE 6-6

ADDITIONAL RESIDUALS MANAGEMENT IN 1988
MAXIMUM TREATMENT CASE

Technology/ Facility	Additional Waste Handled in New Jersey in 1988 Over 1983 (tons)	Additional Residuals Generated (tons)	Selected Management Method for Residuals
Aqueous Treatment	76,000	3,800 (5%)[1]	Land Emplacement
Solvent Recovery	14,000	1,260 (9%)[2]	Incineration
Fuel Blending	-52,000	5,200 (10%)[1]	Land Emplacement (decrease)
Incineration	122,000	24,400 (20%)[3]	Land Emplacement
Oil Recovery	47,000	4,700 (10%)[1]	Incineration
Advanced Thermal Destruction	19,000	4,750 (25%)[4]	Land Emplacement
Ion Exchange Metals Recovery	3,000	2,550 (85%)[5]	Land Emplacement
Pyrometallurgical Metals Recovery	4,000	0[6]	--

1 Derived from Technical and Economic Analysis of Hazardous Waste Management Facilities, prepared by Environmental Resources Management, Inc. for Minnesota Waste Management Board, October 1983.
2 Based on 1983 manifested receipts and residual shipments by New Jersey solvent recovery facilities.
3 Based on manifested receipts and off-site shipments from Rollins incinerator in 1981, 1982, and 1983.
4 Based on an analysis of expected incoming waste streams: 58 percent aqueous wastes (5 percent residual)/42 percent sludges and solids (50 percent residual). Residual estimates based on best engineering judgment.
5 Derived from Technical Report: Central Recovery Facility Feasibility Study by Pope-Reid Associates, Inc. for Minnesota Department of Energy, Planning and Development and Metropolitan Council. 30 November 1982.
6 Residual product not hazardous.

TABLE 6-7

SHORTFALL IN FACILITY CAPACITY
FOR MANAGING NEW JERSEY MANIFEST WASTE
(In Thousands of Tons)

	Materials Recovery				Energy Recovery	Treatment/Destruction				Disposal	
Waste Type	Solvent Recovery	Oil Recovery	Ion Exchange Metals Recovery	Pyrometallurgical Metal Recovery	Fuel Blending	Advanced Thermal Destruction	Incineration	Aqueous Treatment	Land Treatment	Stabilized Land Emplacement	Unstabilized Land Emplacement
Available Capacity											
Existing Capacity	199	0	0	0	443	0	35	409	0	0	0
1983 Waste Imports	44	0	0	0	34	0	13	81	0	0	0
Available Capacity	155	0	0	0	389	0	22	328	0	0	0
Market-Driven Case											
Demand	34	0	0	3	120	0	47	227	20	52	67
Shortfall New Capacity	0	0	0	3	0	0	25	0	20	52	67
Maximum Treatment Case											
Demand	37	47	3	4	23	19	131	215	0	70	39
Shortfall	0	47	3	4	0	19	109	0	0	70	39

- A 3,000-ton per year pyrometallurgical metal recovery facility.

Existing aqueous treatment, solvent recovery, and fuel blending capacity appear to be adequate to handle New Jersey generators' wastes in this case. However, there are some possible exceptions to this. For example, the pending New Jersey DEP fuel standards and regulations for burning wastes in boilers (expected within six to twelve months) may dictate upgrading the existing fuel blending facilities, particularly in regard to segregating and testing incoming shipments and removing metal contaminants in waste oils.

Maximum Treatment Case

Immediate Needs. The immediately-needed facilities under this case include:

- 110,000 tons per year of incinerator capacity that can handle liquids, sludges, and solids.

- A 110,000-ton per year land emplacement facility for stabilized and unstabilized waste, integrated with a 70,000-ton per year stabilization facility.

Needs Upon Full Implementation. Facilities required after full implementation of the maximum treatment case include:

- A 47,000-ton per year waste oil re-refinery.

- 19,000 tons per year of advanced thermal destruction capacity.

- A 3,000-ton per year ion exchange central metals recovery facility featuring regeneration of ion exchange canisters.

- A 4,000-ton per year pyrometallurgical metals recovery facility.

As with the market-driven case, existing aqueous treatment, fuel blending, and solvent recovery capacity appear to be adequate to handle New Jersey generators' wastes. However, the same possible exceptions apply to the maximum treatment case as discussed in the market-driven case.

Commercialization Case

The case which makes maximum use of non-commercial capacity is a variant of the market-driven case. It differs from the market-driven case in that it would feature the commercialization of certain on-site facilities and the use of this capacity in preference to siting new facilities offering the same technology.

As discussed in Chapter Four, a large amount of waste is managed on site at facilities owned and operated by the generator of the waste. In Chapter Six, the consultant, working with a trade association, surveyed selected owners of on-site facilities to evaluate the prospect that such facilities could meet New Jersey's needs for additional commercial capacity. Appendix C describes the survey and the results of the survey. In summary, the survey found little interest on the part of the facility owners to commercialize.

Ignoring the issue of the operators' willingness to commercialize, there are on-site facilities which, with expansion and modification, could possibly meet all of New Jersey's needs for new facilities. For example, existing hazardous waste land emplacement facilities and land treatment facilities operated by New Jersey generators could dispose of other New Jersey wastes dependent upon their design, their ability to meet the siting criteria, and other considerations. To do this on a continuous basis for a reasonable amount of time would require expansion if not modification of the land emplacement facilities and land treatment facilities.

Similarly, the need for additional incineration capacity could technically be met by commercializing existing on-site facilities. However, some major expansions and modifications in the facilities would be required as the collective capacity of on-site incinerators total about 4,000 tons per year.

To overcome the lack of interest on the part of on-site facility owners to commercialize, the state would have to undertake some major new programs, e.g., sharing of liability, assisting the permitting process, providing economic incentives, and amending the siting criteria. However, the comparatively small amount of capacity available does not warrant such programs. There may be some special situations where commercialization could benefit, e.g., recovery of a particular metal; however, a commercialization program will not provide New Jersey with the needed facility capacity within the time period envisioned by the Major Hazardous Waste Facilities Siting Act.

Cost to Generators

Facility Charges to Generators

Table 6-8 compares the relative costs to New Jersey generators of the market-driven and maximum treatment cases. The commercialization case would have approximately the same costs as the market-driven case.

Table 6-8 reflects the following:

1. Approximate unit (per-ton) prices, typically charged by operating facilities or estimated from an analysis of capital and operating costs, are used for estimating the cost of each type of facility.

2. Transportation costs are not included.

3. Long-term liability costs are not included.

Table 6-8 multiplies the unit price for a particular type of facility by the demand assigned to that type. Demand is that shown in Table 6-7. Unit prices can vary considerably from those shown in Table 6-8 dependent primarily upon waste characteristics. In fact, for some facilities, and some wastes, generators can receive a credit. Unit prices have been estimated using the following sources:

- Preliminary Technical and Economic Analysis of Seven Types of Hazardous Waste Recovery and Treatment Facilities, prepared by ERM for Missouri Environmental Improvement and Energy Resources Authority, July 1984.

- Technical and Economic Analysis of Hazardous Waste Management Facilities, prepared by ERM for the Minnesota Waste Management Board, October 1983.

- Hazardous Waste Management Technologies - An Assessment, prepared by ERM for the Pennsylvania Department of Environmental Resources, February 1983.

- Comprehensive Hazardous Waste Management Study, prepared by ERM for the Mississippi Hazardous Waste Council, January 1982.

TABLE 6-8

COMPARATIVE ANNUAL COSTS TO NEW JERSEY GENERATORS
OF MAXIMUM TREATMENT AND MARKET-DRIVEN CASES
(1984 DOLLARS)

	Estimated Costs for 1988 Demand		
Facility Type	Comparative Unit Cost ($/ton)[1]	Market-Driven Costs ($1,000/yr)	Maximum Treatment Costs ($1,000/yr)
RECOVERY FACILITIES			
Solvent Recovery	100	$ 3,400	$ 3,700
Ion Exchange Metals Recovery	300	0	900
Fuel Blending	(20)	(2,400)	(500)
Waste Oil Recovery	30	0	1,400
Pyrometallurgical Metals Recovery	50	200	200
TREATMENT FACILITIES			
Aqueous Treatment	55	12,500	11,800
Land Treatment	50	1,000	0
Incineration	325	15,300	42,600
Advanced Thermal Destruction	500	0	9,500
DISPOSAL FACILITIES			
Land Emplacement	75	5,000	2,900
Land Emplacement with Stabilization	100	5,200	7,000
ESTIMATED TOTAL COSTS (rounded)		$40,000	$80,000

1 These are generalized estimates and vary widely. For example, some generators may actually be paid for solvents they send to solvent recovery facilities.

- Review of Activities of Major Firms in the Commercial Hazardous Waste Management Industry: 1982 Update, prepared by Booz-Allen and Hamilton, Inc. for the Office of Policy Analysis, U.S. EPA, August 1983.

- Technical Report No. 1 -- Plating Industry Compliance with Environmental Regulations -- Costs and Cost Comparisons, prepared by Pope-Reid Associates, Inc. for the Minnesota Waste Management Board, July 1983.

- Hazardous Waste Quantities and Facility Needs in Maryland, prepared by Arthur D. Little, Inc. for the Maryland Hazardous Waste Facilities Siting Board, August 1981.

- General knowledge of hazardous waste management facilities and costs.

Table 6-8 shows that the costs to generators for off-site management of hazardous waste will depend greatly upon which case is advanced in New Jersey. A policy decision to develop the maximum treatment case fully will cost New Jersey generators about $40 million more per year than the market-driven case, assuming that generators use the new facilities versus optional types available in other states.

Transportation Costs

Because New Jersey generators currently ship about 45 percent of their waste to facilities in other states, the development of new facilities in New Jersey will at least reduce the transportation component of total costs for managing waste off site.

Chapter Five gives estimates for costs of transportation and indicates existing out-of-state facilities used by New Jersey generators. Obviously, developing new facilities in New Jersey will reduce the costs of the present practice of transporting wastes longer distances to facilities in other states. Table 6-9 estimates the potential savings in transportation costs of developing new incineration and land emplacement facilities in New Jersey to accept that waste currently exported to facilities in other states. The savings range from $3.6 to $4.5 million per year.

TABLE 6-9

TRANSPORTATION COST SAVINGS OF
DEVELOPING AND USING NEW FACILITIES IN NEW JERSEY

	Quantity of Waste Anticipated to be Exported in 1988 Without New Facilities (ton/yr)[1]	Weighted Average Distance Away[2] (miles)	Average Transportation Costs ($/ton-mile)	Total Approximate Cost ($1,000/year)
Existing Out-of-State Facilities				
Cement Kilns	32,000	160	$.13 to .18	700 - 900
Incinerators	16,000	600	$.10 to .13	1,000 - 1,200
Land Emplacement Facilities	78,000	380	$.10 to .13	3,000 - 3,900
TOTAL				4,600 - 6,000
New New Jersey Facilities				
All	126,000[3]	50[4]	$.16 to .24	1,000 - 1,500
TOTAL SAVINGS (rounded)				3,600 - 4,500

1 Based on percentage of total waste stream going to those facilities in 1983.

2 Weighted according to quantity of New Jersey waste accepted in 1983.

3 Sum of above.

4 Transportation assumed to average fifty miles one way for new facilities in New Jersey.

Prospects for Private Development of Facilities

The intent of New Jersey's siting program is that needed new facilities be developed and operated by the private sector. Whether that occurs depends mostly on the economic attractiveness of a given facility, to understand which would require an analysis of expected return on investment, degree of competition, and level of business risk. Although such an analysis is beyond the scope of this study, some general conclusions are still possible.

The past and present efforts by commercial waste management companies to site new facilities in New Jersey indicate that market considerations and profit potential for both a new incinerator and land emplacement facility warrant the business risks. The quantity of waste expected to be attracted by both types of facilities should, in comparison with the size of viable facilities operated elsewhere, yield an acceptable return on investment. The prospects for development are not as high for the other types of facilities.

Land Emplacement Facility

As stated in Chapter Four, the long-term prospects for adequate land emplacement capacity remain uncertain. A New Jersey land emplacement facility should represent an attractive alternative for generators, especially if existing facilities continue to close (five landfills closed in Pennsylvania and Maryland in the last two years). Not only do continuously-generated wastes present significant demand, but also do wastes generated from site cleanups and closures.

Other than siting, the major obstacle to developing a land emplacement facility could be the rather stringent limitations which the New Jersey DEP will place on the facility design and operation, in comparison with limitations on existing facilities in other states. Special limitations could make a facility non-competitive. As a possible example of this, the Major Hazardous Waste Facilities Siting Act requires that "...all new major hazardous waste facilities shall be:

1. totally or partially constructed above existing grade;

2. physically accessible to inspection personnel;

3. designed to allow 99.9 percent extraction of all hazardous waste stored or disposed of therein; and

4. designed to prevent any significant adverse impact on the environment or public health".

New land emplacement facilities will require double liners (liner thickness being greater than that recommended in the RCRA Guidance Documents), ground water monitoring systems, leak detection systems, leachate collection systems, and gas monitoring. Furthermore, the New Jersey DEP has proposed regulations restricting acute hazardous (P wastes) and toxic (U wastes) from land emplacement facilities. These regulations could reduce the market demand more so than reflected in Table 6-7.

Incineration Facility

Rollins' rotary kiln incinerator operated at less than eighty percent capacity in 1983. This reflects mostly the fact that Rollins is selective in the wastes it accepts and is more expensive than competing facilities. As explained in Chapter Four, the trend to restrict certain organic wastes from landfill disposal and to regulate more stringently the practice of fuel blending and burning of wastes in boilers should increase the demand for incineration services.

If Rollins' incinerator gets a permit to burn PCB wastes, the available capacity for hazardous wastes could be severely limited. In fact, Rollins could turn away some of its current hazardous waste customers in favor of PCB wastes, which is a more lucrative market, causing a greater demand for a new New Jersey incinerator.

The major obstacle to developing an incinerator is the high degree of competition represented by less expensive, substitute technologies provided at facilities in other states. Of the 43,000 tons of waste manifested by New Jersey generators and thermally destroyed in 1983, 28,000 tons went to cement kilns in other states. The kilns should continue to compete for a large share of the market. The restriction in the RCRA amendments prohibiting hazardous waste from kilns in incorporated municipalities having populations of greater than 50,000 unless the kiln meets RCRA incinerator standards should not impact these facilities. Also, much of the organic sludges and solids assigned to incineration, even under the market-driven case, are currently acceptable for disposal at landfills in the Midwest and Southeast.

Land Treatment Facility

Although no company has proposed to develop a land treatment facility in New Jersey, many companies in the nation land treat wastes on their own sites because they believe it is the most cost-effective alternative for those wastes. Such a facility should be commercially viable. The major obstacle to developing a land treatment facility could be the rather stringent manner in which the New Jersey DEP might review an application to construct one. Commercial land treatment facilities, if not carefully managed, particularly with regard to waste receipts, can cause permit violations and thus make commercial development risky. Furthermore, there are no existing commercial facilities which offer only land treatment services; each is typically combined with a land emplacement facility. Thus, a commercial land treatment facility is not likely in New Jersey; more likely would be the development of on-site, dedicated land treatment capacity by generators of land treatable wastes.

Metals Recovery and Advanced Thermal Destruction Facilities

In comparison with the incineration and land emplacement facilities, the two metals recovery facilities and the advanced thermal destruction facility specified in the maximum treatment case do not appear as economically attractive. Although the capital investments required are less for these facilities, the market demand is much smaller. The developer of a centralized metals recovery facility must coordinate his plans with the industrial wastewater pretreatment program, whose future implementation is subject to delays and other unknowns. Nevertheless, the concept continues to be investigated and a strong signal by the state to support the siting and development of such facilities could attract the necessary investment. The pyrometallurgical metal recovery process shows only a small demand, and a facility in Pennsylvania currently offers such a service. Some of the advanced thermal destruction technologies show promise; however, most are still in the testing phase of development.

Waste Oil Re-Refinery

The waste oil re-refinery represents a major capital investment, upwards of $10 million. Analysis done for other states[2] indicates that to realize an acceptable return on such a large investment would necessitate purchasing waste oil or selling recovered oil at somewhat more favorable prices than the market will currently bear. More stringent state and federal regulations for fuel blending are expected, and this should result in a shift of undetermined size from fuel blending to oil re-refining. Nevertheless, a New Jersey facility would still have to compete with fuel blending and incineration facilities plus re-refineries in Canada and eastern Pennsylvania.

Summary

In summary, the prospects of the private sector developing the specified facilities are rated as follows:

Incineration	Moderate to High
Land Emplacement	Moderate to High
Land Treatment	Low
Centralized Metals Recovery	Low to Moderate
Pyrometallurgical Metals Recovery	Low
Advanced Thermal Destruction	Low to Moderate
Waste Oil Re-Refinery	Low

NEEDED NEW FACILITIES

Needed Types of Facilities

The following criteria will be used to determine whether a particular type of facility is needed by New Jersey:

1. A shortfall exists between projected 1988 demand for such a facility and the capacity available within New Jersey for both the "market-driven" and "maximum treatment" cases; and

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2 Technical and Economic Analysis of Hazardous Waste Management Facilities, prepared by ERM for the Minnesota Waste Management Board, October 1983.

2. Given the size of the shortfall, it is reasonable to assume that private waste management companies would develop such a facility in New Jersey without public subsidy and that the price of services would be competitive with similar facilities available in other states.

These two criteria recognize the intent of the New Jersey Hazardous Waste Facilities Siting Act that the private sector develop the facilities, i.e., market forces should govern and prompt private investment in the needed facilities. Nevertheless, the first criterion assures that facilities developed by market forces will support and not preempt the long-term goal of maximum recovery and treatment of hazardous waste.

These two criteria and the findings of the previous section indicate a clear need in New Jersey to develop two types of facilities:

Incineration
Land Emplacement

Incineration Capacity

As described in Chapter Three, there are numerous incineration technologies. The appropriate technology for New Jersey should meet the following criteria:

1. Commercially proven

2. Sufficiently versatile to make the transition from the "market-driven" to the "maximum treatment" case.

Commercially Proven. The appropriate technology should be commercially proven as evidenced by numerous applications in the United States and elsewhere. This will: (a) facilitate permitting in that the U.S. EPA or the New Jersey DEP will have precedents upon which to base their reviews; (b) facilitate public understanding in that the experiences of facilities which have operated for several years can be analyzed to evaluate the impact upon potential host communities; and (c) help assure the continuous availability of capacity by avoiding the business risks associated with experimental and demonstration facilities. This criterion eliminates all incineration technologies except rotary kiln, liquid injection, multiple hearth, fluidized bed, and wet air oxidation.

Versatility. Because the siting program in New Jersey depends upon private initiative and investment, the incineration technology should accommodate the "market-driven" demand. However, the technology should have the versatility to accommodate the types of wastes that will be generated in the future as the New Jersey regulatory system moves toward the "maximum treatment" case. Tables 6-3 and 6-5 show that solids and sludges in the waste stream assigned to incineration increase from about half of the total in the market-driven case to about two-thirds in the maximum treatment case. This trend, and the wide variety of wastes incinerated in both cases, identifies rotary kiln incineration as the most needed technology, with specialized incinerators such as fluidized bed and liquid injection units having second priority.

Capacity. New Jersey initially needs incineration capacity of 50,000 to as much as 75,000 tons per year. This represents a balance between the market-driven and the maximum treatment cases. This range is dictated by the changing hazardous waste regulatory climate.

After the publication of the draft Plan, the RCRA amendments of 1984 were enacted. While the impact of these changes was to a degree anticipated in the draft Plan, it now appears that the nation, and New Jersey, is advancing rapidly towards a regulatory system which will reduce land disposal and encourage maximum treatment. Considering the lengthy time required to plan, designate, permit, construct, and start up a new facility, in comparison with the potentially rapid pace at which the regulatory system is undergoing change, it is clear that New Jersey needs to begin developing capacity well beyond the shortfall specified for the market-driven case.

Environmental Assessment. As would be expected, the chief environmental impact associated with incineration is from its air emissions. Even with a high-efficiency incineration system and state-of-the-art gas cleaning equipment, some toxic organic material will escape destruction and be emitted to the atmosphere. Even though the amount is a very small percentage of the waste incinerated (typically less than 1/100th of one percent), the sheer volume of waste handled requires that an analysis be conducted to determine the potential impact of the absolute amount on receptors and to prevent emissions which are injurious to human health or welfare, plant or animal life, or property. Such an analysis would be based upon tests to define the type and amount of air contaminants, site-specific dispersion models to predict the concentrations of contaminants at ground level receptor locations, and monitoring of actual operations.

Summary. New Jersey needs one or more incineration facilities to satisfy an incineration capacity shortfall of between 50,000 to as much as 75,000 tons per year. The rotary kiln described earlier in the Plan is preferred because of its versatility and proven performance. Once this initial capacity has been approved, the Siting Commission will again analyze changes in the regulatory system, any increased market demand for incineration, and technical advances in developing various incineration technologies to determine if additional facilities are needed. Full implementation of the maximum treatment case could necessitate additional incineration capacity up to as much as 110,000 tons per year.

Stablization/Land Emplacement Facility

The shortfall in disposal via land emplacement would start at 120,000 tons per year with the market-driven case and decrease to 110,000 tons per year with the maximum treatment case. The makeup of the waste changes more so, with maximum treatment case wastes having a higher percentage of residuals from waste treatment facilities. Also, in the maximum treatment case, more of the wastes assigned to land emplacement are stabilized.

Capacity. Economically-viable commercial land emplacement facilities range in size from a minimum of about 30,000 tons per year to a maximum of over 200,000 tons per year. These considerations suggest that only one land emplacement facility is required in New Jersey. It should have the capability to stabilize waste as well as dispose of waste directly.

The annual requirements for land emplacement area are calculated as follows:

Case	Waste Demand (tons/year)	Stabilization Additives[1] (tons/year)	Volume Requirements[2] (cubic yards/year)	Area Requirements[3] (acres/year)
Market-Driven	120,000	78,000	172,000	4
Maximum Treatment	110,000	106,000	180,000	4

1 Assumes 1.5 tons of stabilizing material (lime, fly ash) for every ton of waste to be stabilized.

2 Assuming 1.0 ton per cubic yard for unstabilized waste, 1.25 tons per cubic yard for stabilized waste.

3 Assuming an average landfill height of 25 feet, excluding buffer zones and area between cells.

The determination of needed capacity for a land emplacement facility is approached differently than for a treatment facility: site life must be considered. It is reasonable to assume an active life of twenty years for the needed land emplacement facility. The scope of this project did not include long-term projections of waste demand; however, it seems reasonable to assume that demand will remain constant as any increase in generation beyond 1988 could be offset by source reduction, reduced need for site cleanups, and shifts to substitute treatment and disposal technologies.

These assumptions indicate that New Jersey needs a land emplacement facility with a cell area of about eighty acres. This area excludes buffer zones and unused area between cells.

Environmental Assessment. Because of the new land disposal regulatory requirements and the special provisions of the Siting Act, a land emplacement facility differs greatly from the landfills that have given rise to numerous Superfund sites. The facility would be designed and operated to contain emplaced waste, to minimize the generation of leachate, and to collect leachate as it is generated.

The potential for ground water pollution still represents the most significant problem for a landfill. Nevertheless, significant off-site ground water contamination can be prevented in a carefully sited and designed landfill that is properly operated and monitored and has adequate provisions for closure and post-closure care.

Current regulations and program requirements prescribe several protective barriers, and virtually all must fail for off-site contamination to occur. These protective barriers are as follows:

1. Prohibition of certain wastes
2. Liners
3. Leak detection
4. Leachate collection
5. Cover
6. Ground water monitoring
7. Maintenance

In addition, the siting criteria developed by New Jersey DEP place a number of restrictions on where a facility can be located, recognizing that site characteristics can minimize risk to public health and the environment. Hence, the protection afforded by proper siting, the construction and operation features described above, and the ability for corrective action if needed assure the safety of a land emplacement facility. Still, much remains unknown about the effective life and performance of landfill liner materials and the mobilization, migration, and attenuation of waste. For this reason, landfills should be operated as a containment facility with necessary provisions for perpetual maintenance and monitoring after closure.

Consideration of Facilities Needed Upon Full Implementation of the Maximum Treatment Case

The facilities specified in the Plan are needed now and still still be required in the future when New Jersey moves to full implementation of the maximum treatment case.

The facilities specified by this Plan tend to be general in their application, i.e., can handle a broader range of wastes. As New Jersey moves fully to the maximum treatment case, technologies specific to certain wastes will be developed and will take a portion of the markets of the more general facilities. Should a waste oil re-refinery be constructed, for example, it would draw some wastes away from fuel blending. Still, the wastes projected for the more specialized facilities in the maximum treatment case can, for the most part, be managed by New Jersey's existing facilities and the new incineration and landfill facilities specified by this Plan.

Updating the Plan

The analysis indicates, for the maximum treatment case, a need for some types of facilities not included in the market-driven case:

- Waste Oil Re-refinery
- Advanced Thermal Destruction
- Ion Exchange Metals Recovery

For various reasons, the Plan cannot specify that New Jersey needs these facilities. More planning information is required and/or some changes in the regulatory system are needed. The Commission can reexamine the need for such facilities when updating the Plan.

The hazardous waste management industry is undergoing rapid change. As existing facilities close, New Jersey DEP promulgates new regulations, new technologies develop, and generators alter waste management practices, the relationship between supply and demand changes also. The Plan is conceived as part of a system in which the development initiative is left up to private enterprise, and the development of facilities in New Jersey could follow several directions.

Also, the Plan is based on a reasonable data base but it had some limitations. Information about generators' preferences and future plans was minimal.

The Major Hazardous Waste Facility Siting Act recognizes these dynamics and requires that the Plan be revised and updated every three years, or more frequently dependent upon changes in existing facilities, waste generation, and technological advances.

Wastes Not Manageable by Specified Facilities

The Plan specifies incineration and land emplacement facilities which technically could treat and dispose of all wastes generated in New Jersey. Realistically, however, facilities capable of handling all of New Jersey's waste types and quantities may not be developed. This is especially true given the Commission's proposed hierarchy of management. For example, waste assigned to oil re-refining and land treatment might not exist in sufficient quantities to attract the private development of these types of facilities. Therefore, the Plan must be flexible enough to allow for the reassignment of such wastes to other available technologies. Further, the Commission in no way wishes to discourage private developers from proposing alternative technologies to deal with these limited waste streams. The Commission will evaluate any private enterprise proposal to develop such facilities and would designate such facilities as needed and appropriate if the developer meets the following test:

1. The facility would handle types of waste which the existing and specified facilities cannot manage because of (a) technical constraints, (b) present or clearly-anticipated regulatory requirements, or (c) capacity limits.

2. The facility would make the total system of waste management in New Jersey more effective, from environmental and economic perspectives, than the specified and existing facilities.

3. The facility would be more supportive of the Commission's policies for source reduction, materials and energy recovery, waste exchange, and recycling than the specified and existing facilities.

This provision of the Plan, in summary, allows the Commission to designate types of facilities not specified in the Plan, provided the above "test" is met. For example, a New Jersey DEP requirement to ban the land disposal of metal plating sludge could necessitate a metals recovery facility whose capacity would have to be deduced from that specified for a landfill. As another example, a New Jersey DEP restriction on waste-derived fuels could necessitate substituting a new type of facility for existing fuel blending operations. In the case of waste oil, the Commission should first consider proposals for a waste oil re-refinery because that type of facility is indicated in the maximum treatment case which supports the Commission's hazardous waste management hierarchy. If such a facility were not proposed, the Commission will consider proposals for other technologies but designate a type only if the above "test" were met.

APPENDIX A

U.S. EPA/NEW JERSEY DEP
HAZARDOUS WASTE CODING SYSTEM

APPENDIX A

U.S. EPA/NEW JERSEY DEP HAZARDOUS WASTE CODING SYSTEM

Waste Code	Waste Name[1]	Waste Code	Waste Name
D001	Characteristic of Ignitability	F007	Plat. Solu. of Electrplt. Oper.
D002	Characteristic of Corrosivity	F008	Plat. Sludge of Electrplt. Oper.
D003	Characteristic of Reactivity	F009	Strip. and Solu. Electroplt. Oper.
D004	Arsenic	F010	Sludge-Oil Bath of Metl. Treat. Oper.
D005	Barium	F011	Solu.-Salt Bath of Metl. Treat. Oper.
D006	Cadmium	F012	Qnch. Sludge of Metl. Treat. Oper.
D007	Chromium	F013	Float Tailing of Metl. Recov. Oper.
D008	Lead	F015	Cyanide Solu. of Metl. Recov. Oper.
D009	Mercury	F017	Paint Sludge - Mechtelect. Prod. Ind.
D010	Selenium	F018	Wastewater Sludge of Ind. Painting
D011	Silver	F019	Wastewater Sludge of Conv. Coating Aluminum
D012	Endrin	K001	Sludge of Wood Preserv.-Creosote, etc.
D013	Lindane	K002	Wastewater Sludge of Chrome-Yell/Orange
D014	Methoxychlor	K012	Acrlontrile Btms. - Purification Of.
D015	Toxaphene	K015	Benzyl Chlori. Btms. - Distilltn. Of.
D017	2,3,4-TP (Silvex)	K016	Distiltn. Residues of Carbon Tetra.
F001	Spt. Hal. Solv. and Sludge (Degreasing Oper.)	K020	Vinyl Chloride Distil. Btms.
F002	Spt. Hal. Solv. and Still Bottom of Degreasing	K021	SB Waste of Fluromethanes Prod.
F003	Non-Hal. Solv. and Still Bottom (Xylene, etc.)	K022	Prod. Tars of Phenol/Acetone
F004	Cresols, Nitrobenz. Solv. and Still Bottom	K023	Lite Ends of Produ. Pathalic Anh.
F005	Non-Hal. Solv. and Still Bottom (Toluene, etc.)	K024	Phthalic. Anhydride Btms. of Prod.
F006	Wastewater Sludge of Electrplt. Oper.	K030	Tri-Perchloethylene Prod. Btms.

APPENDIX A (continued)

Waste Code	Waste Name	Waste Code	Waste Name
K031	Salts from MSMA/Cacodylic Acid	P002	1-Acetyl-2-Thiourea
K032	Wastewater Sludge of Chlordane Prod.	P003	Aceolein
K034	Filter Solids of Chlordane Prod.	P004	Aldrin
K035	Wastewater Sludge of Creosote Prod.	P005	Allyl Alcohol
K047	Pink/Red H20 of TNT Operations	P010	Arsenic Acid
K048	DAF Float of Petro./Refining Ind.	P011	Arsenic Pentoxide
K049	Oil Emulsion Solid-Petro./Ref. Ind.	P012	Arsenic Trioxide
K050	H.E.B. Sludge of Petro./Ref. Ind.	P013	Barium Cyanide
K051	API Sludge of Petro./Ref. Ind.	P015	Beryllium Dust
K052	Tank Btms. - Leaded Petro./Ref. Ind.	P018	Brucine
K053	Chrome Trimmings of Leather Ind.	P019	2-Butanone Peroxide
K055	Buffing Dust of Leather Ind.	P021	Calcium Cyanide
K061	Emission Sludge of Furnace Prod. of Steel	P022	Carbon Disulfide
K062	Pickle Liq-Steel Finishing Oper.	P023	Chloroacetaldehyde
K063	Lime-Sludge Pickle-Steel Finish Oper.	P029	Copper Cyanides
K069	Emission Sludge of Lead Smelting	P030	Cyanides
K078	Paint Ind. Solv. Cleaning Wst.	P032	Cyanogen Bromide
K079	Paint Ind./Haz./Caust. Cleaning Wst.	P035	2,4-Dichlorophenoxyacetic Acid
K081	Paint Ind. Wastewater Sludge	P039	Disulfoton
K083	Distiltn. Btms. of Aniline Prod.	P044	Dimethoate
K086	Ink Ind. Wst., Washes, Sludge	P047	4,6-Diniro-O-Cresol and Salts
K087	Tank Tar Sludge of Coking Opert.	P064	Isocyanic Acid, Methyl Ester
K104	Wastewater Strm. by Nitrobenzen/Ani.	P066	Methomylactonitrile
P001	3 (Acetonyl Benzyl)-4-Hydroxycourmarin	P069	2-Methyl

Waste Code	Waste Name
P071	Methyl Parathion
P074	Nickel Cyanide
P076	Nitric Oxide
P077	P-Nitroaniline
P078	Nitrogen Dioxide
P089	Parathion
P090	Pentachlorophenol
P092	Phenylmercuric Acetate
P094	Phorate
P095	Phosgene
P096	Phosphine
P097	Phosphorothioic Acid, O,O-Dimethyl
P098	Potassium Cyanide
P100	1,2-Propanediol
P102	2-Propynl-Ol
P105	Sodium Azide
P106	Sodium Cyanide
P107	Strontium Sulfide
P110	Tetraethyl Lead
P115	Thallium (I) Sulfate
P117	Thiuram
P120	Vanadium Pentoxide
P121	Zinc Cyanide
P123	Camphene, Octachloro

Waste Code	Waste Name
U001	Acetaldehyde (I)
U002	Acetone (I)
U003	Acetonitrile (I,T)
U005	Acetamide, N-9H-Fluoren-2-YL
U006	Acetyl Chloride (C,R,T)
U007	Acrylamide
U008	Acrylic Acid (I)
U009	Acrylonitrile
U011	Amitrole
U012	Aniline (I,T)
U013	Asbestos
U017	Benzal Chloride
U019	Benzene (I,T)
U021	Benzidine
U022	Benzo (A) Pyrene
U027	Bis(2-Chloroisopropyl) Ether
U028	Bis(2-Ethylehexyl) Phthalate
U031	N-Butyl Alcohol (I)
U032	Calcium Chromate
U036	Chlordane, Technical
U037	Chlorobenzene
U038	Chlorobenzilate
U043	Chloroethene
U044	Chloroform

Waste Code	Waste Name
U051	Creosote
U052	Cresols
U054	Cresylic Acid
U055	Cumene (I)
U056	Cyclohexane (I)
U057	Cyclorhexanone (I)
U061	DDT
U068	Dibromomethane
U069	Di-N-Butyl Phthalate
U070	O-Dichlorobenzene
U076	1,1-Dichloroethane
U077	1,2-Dichloroethane
U078	1,1-Dichloroethylene
U080	Dichloromethane
U083	1,2-Dichloropropane
U088	Diethyl Phthalate
U092	Dimethylamine (I)
U099	1,2-Dimethylhydrazine
U101	2,3-Dimethylphenol
U102	Dimethyl Phthalate
U103	Dimethyl Sulfate
U105	2,4-Dinitrotoluene
U107	Bi-N-Octyl Phthalate
U108	1,4-Dioxane

Waste Code	Waste Name
U109	1,2-Diphenylhydrazine
U112	Ethyl Acetate (I)
U113	Ethyl Acrylate (I)
U114	Ethylenebis (Dithiocarbamic Acid)
U115	Ethylene Oxide (I,T)
U116	Ethylene Thiourea
U120	Fluoranthene
U121	Fluorotrichloromethane
U122	Formaldehyde
U123	Formic Acid (C,T)
U126	Glycidylaldehyde
U132	Hexachlorophene
U133	Hydrazine (R,T)
U134	Hydrofluoric Acid (C,T)
U135	Hydrogen Sulfide
U138	Iodomethane
U140	Isobutyl Alcohol (I,T)
U142	Kepone
U144	Lead Acetate
U147	Maleic Acetate
U150	Melphalan
U151	Mercury
U154	Methanol (I)
U158	4,4-Methylenebis (2-Chloraniline)

Waste Code	Waste Name
U159	Methyl Ethyl Ketone (I,T)
U160	Methyl Ethyl Ketone Peroxide (R,T)
U161	Methyl Isobutyl Ketone (I)
U162	Methyl Methacrylate (I,T)
U164	Methylthiouracil
U165	Naphthalene
U166	1,4-Naphthalenedione
U167	1-Naphtylamine
U169	Nitrobenzene (I,T)
U170	4-Nitrophenol
U174	N-Nitrosodiethylamine
U179	N-Nitrosopiperidine
U180	N-Nitrosopyrrolidine
U184	Pentachloroethane
U186	1,3-Pentadient
U188	Phenol
U189	Phosphorus Sulfide (R)
U190	Phthalic Anhydride
U192	Pronamide
U196	Pyridine
U197	P-Benzo Quinone
U200	Reserpine
U201	Resourcinol
U208	1,1,1,2-Tretrachloroethane

Waste Code	Waste Name
U209	1,1,2,2-Tetrachloroethane
U210	Tetrachloroethylene
U211	Tetrachloromethane
U213	Tetrahydrofuran (I)
U214	Thallium (I) Acetate
U219	Thiourea
U220	Toluene
U221	Toluenediamine
U222	O-Toluidine Hydrochloride
U223	Toluene Diisocyanate (R,T)
U224	Toxaphene
U226	1,1,1-Trichloroethane
U227	1,1,2-Trichloroethane
U228	Trichloroethylene
U229	Trichlorfluoromethane
U232	2,4,5-Trichlorophenoxyacetic Acid
U235	Tris (2,3-Dibromopropyl) Phosphate
U238	Urethane
U239	Xylene (I)
U244	Thiram
U246	Bromine Cyanide
X103	Acrllylonitrile
X123	Arsenic and Compounds, NOS[2]
X126	Arsenic Trioxide

APPENDIX A (continued)

Waste Code	Waste Name	Waste Code	Waste Name
X176	Chloroform	X722	Waste Oil and Btm. of Res. and Commer. Tank Cl
X188	Creosote	X723	Oil Waste of Gas Tank Clean Outs
X190	Cyanides/Soluble Salts and Complexes Of	X724	Waste Pet. Oil of Tank Truck Clean Outs
X210	1,2-Dibromoethane	X725	Oil Spill Cleanup Material
X222	2,6-Dichloropropane	X726	Metal Wkg., Turbine, Diesel, and Quench Oils
X226	1,2-Dichloropropane	X727	Waste Oil Electric Transformers
X228	Dichloropropene, NOS	X728	Waste Oil and Btm. Sludge of Process. Faciliti
X239	Diethylstilbestrol	X799	Containers, Crushed Empty (Rinsed)
X276	Ethyleneoxide	X825	Contaminated Soil/Sludge Aband.
X283	Formaldehyde	X850	Packed Laboratory Chemicals
X334	Nickel and Compounds, NOS	X900	Chemical Process.-Liquid, NOS
X386	Phthalic Ahydride	X905	Gas from Chemical Process.-NOS
X387	Polychlorinated Biphenyl, NOS	X910	Chemical Process.-Solids, NOS
X415	Tetrachloroethylene	X920	Food Processing, NOS
X442	Trichloroethene	X930	Detergent, NOS
X721	Oil Waste from Gas Stations	X940	Poison/Pesticide, NOS

1 Abbreviations appear as listed in the manifest system.

APPENDIX B

LIST OF NAMES AND INTERVIEW QUESTIONS FOR THE TRANSPORTERS CONTACTED IN THE PREPARATION OF THE TRANSPORTATION ANALYSIS

HAZARDOUS WASTE TRANSPORTERS CONTACTED FOR CHAPTER FOUR DATA

AMERICAN RECOVERY, INC.
Baltimore, Maryland

ASHLAND CHEMICAL COMPANY, INC.
Newark, New Jersey

BFI CHEMICAL SERVICES, INC.
Pedricktown, New Jersey

BRALLEY WILLETT TANK LINES, INC.
Richmond, Virginia

CECOS INTERNATIONAL, INC.
Buffalo, New York

CHEMICAL LEAMAN TANK LINES, INC.
Lionville, Pennsylvania

CHEMICAL WASTE MANAGEMENT, INC.
Emelle, Illinois

CONTINENTAL VANGUARD, INC.
Bellmawr, New Jersey

DELAWARE CONTAINER, INC.
Coatesville, Pennsylvania

ELDREDGE, INC.
West Chester, Pennsylvania

GEOCHEM, INC.
Chelmsford, Massachusetts

PEABODY VIP, INC.
Chester, Pennsylvania

FRANK STAMATO, INC.
Lodi, New Jersey

WASTE CONVERSIONS, INC.
Hatfield, Pennsylvania

APPENDIX C

EVALUATION OF COMMERCIALIZATION POSSIBILITIES AT COMPANY-OWNED RCRA FACILITIES: STUDY METHODOLOGY

Introduction

Among the cases for assessing future facility needs for off-site manifested waste, one case involves use of excess capacity at presently non-commercial, company-owned facilities. A survey of such facilities was conducted, the purpose of which was twofold: to investigate the commercialization possibilities of on-site treatment or disposal facilities among New Jersey companies and to ascertain the major obstacles limiting interest in commercialization of excess capacity.

Study results indicated little or no interest in commercialization of on-site facilities within the next three to five years. Liability, public opposition, and additional operational/maintenance requirements were most often named as major obstacles. In general, the respondents also felt that the regulatory situation was still in a state of flux. When foreseeing a need to maintain on-site facilities for their own use, most respondents indicated they would rather invest their resources in completing the Part B process successfully before taking up the question of facility commercialization.

Development of Study

Survey Instrument

The consultant prepared a brief, two-page survey asking respondents four questions:

1. Identify the RCRA-regulated processes on site (a list of regulated treatment and disposal methods was attached to help standardize responses) and percent present utilization.

2. Indicate whether interested or not interested in commercialization.

3. If not interested, indicate primary reasons limiting interest.

4. Indicate incentives necessary to alleviate obstacles to commercialization.

The survey was designed to identify interested companies only and responses were not taken as commitments. A copy of the survey form follows the end of this appendix.

The questions and format of the survey were reviewed by the board of the New Jersey Chemical Industry Council. Suggested revisions were considered and incorporated as appropriate before distribution.

Choice of Survey Recipients

From the list of over 300 original RCRA Part A applications on file with the Bureau of Hazardous Waste Engineering, the consultant selected approximately thirty facilities as possible commercialization candidates. The facilities were chosen from among those listed as having on-site incinerators, landfills, or other treatment processes.[1] The choice of on-site processes for the survey was guided by the preliminary results of the Task One and Task Two reports identifying amounts of waste available to existing treatment processes in New Jersey.

Administration of Survey

The New Jersey Chemical Industry Council mailed surveys to those companies which are members of the Council. This included about sixty percent of the candidate plants. The Council prepared a cover letter describing the purpose of the survey and requesting prompt cooperation.

The Council insured the confidentiality of responses by replacing the name on each survey form with a code before forwarding the information to the Siting Commission's consultant. The Council conducted all follow-up telephone calls to survey recipients and was most helpful in securing additional information from respondents when needed by the consultant to complete the analysis.

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1 Companies with storage facilities only were not considered.

The remaining surveys were mailed by the Siting Commission. The Commission's cover letter and procedures for confidentiality were patterned after those of the Council. Follow-up telephone calls to those survey recipients were also conducted by the Commission.

Survey Responses

Of the thirty surveys mailed, nineteen were determined to be not applicable: eleven were delisted as RCRA-regulated, three closed as hazardous waste facilities, two were Part A listings for future facilities never constructed, and three facilities belonged to plants that ceased primary production. Responses from plants to which the survey was not applicable served as an excellent check on the Task Three work which evaluated status, current activities, and anticipated closures at on-site facilities.

Responses from companies still operating applicable treatment or disposal facilities indicated little interest in commercializing those facilities. While some companies have initiated preliminary discussions regarding the commercialization of their existing facilities, it is not expected that their companies will advance plans to commercialize.

Underutilized capacity appears to exist mostly at on-site incinerators.[2] Cumulatively, though, their total capacity does not exceed 4,000 tons per year; that is less than one-fifth the size of Rollins' one facility in Bridgeport. About 1,000 tons per year of this capacity is permitted for only one waste stream. It would seem then that even if interest were expressed in commercializing on-site facilities and the percentage of underutilization were high, the absolute available capacity would actually be quite low and probably not warrant the investment of resources to begin operating commercially.

Liability, public/community opposition, and additional operational and maintenance requirements were often cited as major obstacles to commercialization. These obstacles are apparently so formidable in the minds of some companies that some responded no incentives could be developed to mitigate them. Discussions with facility representatives revealed additional concerns that the regulatory situation in New

2 Because few companies actually returned the form fully completed and many responses had to be obtained verbally, it was not possible to quantify the extent of excess capacity currently existing at the surveyed plants.

Jersey is still in developmental stages. Companies in or preparing to enter the Part B process seem to be more interested in finalizing their RCRA status and securing their permits before they consider commercializing any excess capacity. Some facilities did speculate that if the Part B permit were granted and acceptance of off-site waste appeared feasible, acceptance would very likely be limited to waste generated by other corporate plants.

Conclusions

The results of the commercialization study suggest that no additional waste treatment or disposal capacity for New Jersey manifested waste will become available due to the commercialization of company-owned, on-site facilities during the time frame of this plan. The potential for on-site facility commercialization may increase after 1988 should the New Jersey DEP develop and implement before that time programs educating the public to the variety and ability of hazardous waste facilities, including their relative position in industrial manufacturing operations.

NEW JERSEY HAZARDOUS WASTE FACILITIES PLAN

Commercialization Study Questionnaire

Prepared by

Environmental Resources Management, Inc.
P.O. Box 357
West Chester, Pennsylvania 19380

For

New Jersey Hazardous Waste Facilities
Siting Commission
CN-406
Trenton, New Jersey 08625
Richard J. Gimello, Executive Director

Facility Owner: ______________________

Code No. __________

1. If you engage in any of the treatment or disposal methods listed on Page 3, please indicate below the handling code, the capacity, and the present and predicted future utilization of this capacity as a percent.

		Percent Utilized		
Handling Code	Capacity	Present	1987	1989
________	________	______	______	______
________	________	______	______	______
________	________	______	______	______
________	________	______	______	______
________	________	______	______	______
________	________	______	______	______

2. If you have underutilized capacity at your hazardous waste treatment or disposal facility, would your company be interested in accepting waste from other Missouri generators on a commercial basis?

- ☐ Interested*
- ☐ Not Interested

Comments: ______________________________

____

____

*If you check "Interested", you need not answer questions 3 and 4. Thank you for your cooperation. If "Not Interested", please continue.

3. If not interested, what are the obstacles?

- ☐ Liability
- ☐ Potential for Contamination of Products
- ☐ Regulatory Burden
- ☐ Public/Community Opposition
- ☐ Need for Reserve Capacity
- ☐ Operation and Maintenance Burdens
- ☐ Planned Closure

Other: ______________________________

____

____

4. Which incentives would remove these obstacles?

- ☐ Freedom from Liability or State Sharing of Liability
- ☐ Technical Assistance in Changeover to to Commercial Operation
- ☐ Tax Credits or Deductions
- ☐ Second Party Leasing of Facility
- ☐ State Endorsement
- ☐ Public Education Program
- ☐ Community Benefits Program

Other: ______________________________

____

This list had been copied from the recent instruction package prepared by NJDEP for Hazardous Waste Facility Annual Report.

HANDLING CODES FOR TREATMENT, STORAGE, AND DISPOSAL METHODS

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1. Storage

S01 Container (barrel, drum, etc.)
S02 Tank
S03 Waste Pile
S04 Surface Impoundment
S05 Other (specify)

2. Treatment

(a) Thermal Treatment
T06 Liquid injection incinerator
T07 Rotary kiln incinerator
T08 Fluidized bed incinerator
T09 Multiple hearth incinerator
T10 Infrared furnace incinerator
T11 Motlen Salt Destructor
T12 Pyrolysis
T13 Wet air oxidation
T14 Calcination
T15 Microwave discharge
T16 Cement kiln
T17 Lime kiln
T18 Other (specify)

(b) Chemical Treatment
T19 Absorption mound
T20 Absorption field
T21 Chemical fixation
T22 Chemical oxidation
T23 Chemical precipitation
T24 Chemical reduction
T25 Chlorination
T26 Chlorinolysis
T27 Cyanide destruction
T28 Degradation
T29 Detoxification
T30 Ion exchange
T31 Neutralization
T32 Ozonation
T33 Photolysis
T34 Other (specify)

(c) Physical Treatment
(1) Separation of components
T35 Centrifugation
T36 Clarification
T37 Coagulation
T38 Decanting
T39 Encapsulation
T40 Filtration
T41 Flocculation
T42 Flotation
T43 Foaming
T44 Sedimentation
T45 Thickening
T46 Ultrafiltration
T47 Other (specify)

(2) Removal of Specific Components
T48 Absorption-molecular sieve
T49 Activated carbon
T50 Blending
T51 Catalysis
T52 Crystallization
T53 Dialysis
T54 Distillation
T55 Electrodialysis
T56 Electrolysis
T57 Evaporation
T58 High gradient magnetic separation
T59 Leaching
T60 Liquid ion exchange
T61 Liquid-Liquid extraction
T62 Reverse osmosis
T63 Solvent Recovery
T64 Stripping
T65 Sand filter
T66 Other (specify)

(d) Biological Treatment
T67 Activated sludge
T68 Aerobic lagoon
T69 Aerobic tank
T70 Anaerobic lagoon
T71 Composting
T72 Septic tank
T73 Spray irrigation
T74 Thickening filter
T75 Tricking filter
T76 Waste stabilization pond
T77 Other (specify)

3. Disposal

D80 Underground injection
D81 Landfill
D82 Land treatment
D83 Ocean disposal
D84 Surface impoundment (to be closed as a landfill)
D85 Other (specify)