# THE BOARD OF CHOSEN FREEHOLDERS

**Ocean County**
**Toms River, New Jersey**
**08753**

Ernest A. Buhr
Freeholder

**244-2121**
**Ext. 321**

20 February 1976

To: Residents and Municipal Officials of Ocean County

I am very pleased to submit to you Volume 1 of the Ocean County Solid Waste Disposal and Resource Management Study. This report was authorized by the Board of Freeholders on April 24, 1974 and represents a cooperative effort of county and municipal officials to identify and evaluate existing solid waste management practices in Ocean County.

The report provides comprehensive data on the legal, financial and administrative aspects of solid waste; recycling and marketing of salvage materials; state-of-the-art analysis of solid waste recycling, disposal and management constraints for Ocean County. It was prepared under the direction of Dr. Michael Disko, President of M. Disko Associates with technical and planning input, guidance and review from Charles M. Pike, County Administrator; Thomas A. Thomas, County Planning Director; Richard E. Lane, County Engineer; A. Morton Cooper, Chairman of the Ocean County Environmental Agency; and Michael Gritzuk, Executive Director of the Ocean County Sewerage Authority and their very able professional staffs. The results of this report will be utilized as a basis for developing a comprehensive solid waste management program for future recycling, energy recovery practices and effective environmental controls on solid waste disposal.

Ocean County has existing major problems in disposing of an estimated 292,500 tons of solid waste annually. These problems are expected to become increasingly acute in the future as a result of the projected rapid growth in the County. The time for Ocean County to address these problems is <u>now</u> - before a crisis develops and a solution becomes increasingly difficult and expensive. This will not be an easy task but it is one which is necessary and one which will require foresight and resolve on the part of County and municipal leaders.

On behalf of the Board of Freeholders and the Mayors Committee on Solid Waste, I urge you to review the findings of this report and to join with the Mayors Committee in seeking a long-term, environmentally sensitive and cost effective solution to the solid waste problem in Ocean County.

Very truly yours,

Ernest A. Buhr

Ernest A. Buhr, Freeholder-Director
Chairman of the Mayors Committee on Solid Waste
EAB/cey

# OCEAN COUNTY
# SOLID WASTE DISPOSAL
# AND
# RESOURCE RECOVERY MANAGEMENT STUDY

## VOLUME I:

## INVENTORY OF EXISTING SOLID WASTE SYSTEMS AND BACKGROUND INFORMATION

Prepared for

THE OCEAN COUNTY BOARD OF CHOSEN FREEHOLDERS
in cooperation with
THE MAYORS COMMITTEE ON SOLID WASTE

December 1975

Prepared by

M. DISKO ASSOCIATES
CONSULTING ENGINEERS
99 NORTHFIELD AVENUE
WEST ORANGE, NEW JERSEY 07052

# 1975

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| Ernest A. Buhr - Freeholder-Director | Charles M. Pike - County Administrator |
| Richard E. Lane - County Engineer | Thomas A. Thomas - Planning Director |

## ACKNOWLEDGMENTS

In addition to the individuals and organizations cited on the preceding page, the following agencies and organizations are gratefully acknowledged for their cooperation and support in the development and preparation of this report.

OCEAN COUNTY MUNICIPAL OFFICIALS

RECLAMATION, CONSERVATION AND RECYCLING GROUPS

SOLID WASTE CONTRACTORS

OFFICIALS FROM SECONDARY MATERIALS INDUSTRIES

OFFICIALS FROM INDUSTRIAL, COMMERCIAL, INSTITUTIONAL, AND AGRICULTURAL FIRMS IN OCEAN COUNTY

THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

THE NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

THE NEW JERSEY DEPARTMENT OF LABOR AND INDUSTRY

THE NEW JERSEY DEPARTMENT OF PUBLIC UTILITIES

In addition, we offer a special thanks to the Ocean County Planning Board staff for their assistance.

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## *SUMMARY*

1. *Ocean County is experiencing rapid residential, commercial, and industrial growth. As the population rises, the demand for goods and services increases with a corresponding increase in commercial and industrial development. As development continues, the quantities of solid waste produced also increase and the proper collection and disposal of those wastes require additional efforts by local governments.*

*Faced with ever-increasing solid waste quantities and dwindling close-in landfill sites, many municipalities are finding it increasingly difficult and expensive to provide for proper solid waste disposal. With this in mind, Ocean County initiated a county-wide solid waste disposal study in an effort to define the solid waste problem. The objectives and scope of the study include the following:*

- *Develop a comprehensive regional solid waste management plan for Ocean County's municipalities; a plan that will ensure an area-wide approach with advantages of inter-governmental cooperation.*
- *Evaluate the economic and financial aspects of a comprehensive regional solid waste management plan.*
- *Enlist citizen and local government support and cooperation with definite roles in plan development and implementation.*

- Formulate the necessary legal rules, standards, and regulations necessary for implementation and operation of the regional plan.

- Determine the organizational responsibilities, structure, and functions to implement and operate the regional solid waste management plan.

- Evaluate the technical and environmental aspects of solid waste collection, transfer, processing, and disposal methods for a comprehensive plan.

This report, Volume I, is an inventory of existing solid waste collection and disposal systems in Ocean County, together with detailed background information. A second volume will outline alternatives for a comprehensive Ocean County solid waste management plan.

2. The environmental impact of any proposed alternate solid waste management and disposal system for Ocean County must be carefully considered. Also important are the trends of suburban development, increased quantities of solid waste, energy and material shortages and national economic and cost patterns. Some of the physical and environmental parameters which must be included in the planning of a solid waste disposal facility include: climate, drainage and flooding, geology, hydrology, groundwater, land use, meteorology, soil, topography and water supply. A detailed discussion of these parameters is included in Chapter II.

3. Ocean County generates many different types of solid waste that require disposal. Some of these, as detailed in Chapter III, include: residential, commercial, industrial, institutional, agricultural wastes, clean-up wastes, abandoned automobiles, road sweepings and municipal debris. In addition, various liquid and semi-liquid chemicals, sludges, etc., receive specialized disposal.

A typical breakdown of Ocean County's residential solid waste is included below:

| COMPONENT | TYPICAL AVER. PERCENTAGE |
|---|---|
| Paper | 41% |
| Metals | 10% |
| Glass | 12% |
| Garbage | 16% |
| Other | 21% |

4. Ocean County utilizes three different solid waste collection systems, as follows:

| TYPE OF COLLECTION | MUNICIPALITIES |
|---|---|
| Municipal Collection System | Beach Haven, Beachwood, Berkeley, Brick, Dover, Eagleswood, Island Heights, Lacey, Lakehurst, Lakewood, Lavallette, Little Egg Harbor, Ocean Gate, Pine Beach, Pt. Pleasant Beach, Seaside Heights, Seaside Park, Ship Bottom, So. Toms River, Stafford, Surf City, Tuckerton |

| *TYPE OF COLLECTION* | *MUNICIPALITIES* |
|---|---|
| *Municipally-Contracted* | *Barnegat Light, Bay Head, Harvey Cedars, Long Beach, Mantoloking, Ocean, Pt. Pleasant, Union* |
| *Private Contractors* | *Jackson, Manchester, Plumsted* |

*Ocean County also generates large amounts of industrial, commercial and institutional waste. Many of these firms contract directly with a private hauler for refuse disposal.*

*The overwhelming percentage of the commercial and industrial solid waste and all of the residential solid wastes are hauled to landfills for disposal. There are 15 municipally operated landfills in the County. In addition, solid waste is also hauled to 2 private landfills in the County and 3 private landfills in Monmouth County. There are also 4 private industrial landfills located in the County that are not open to the general public. Chapter IV details the existing collection and disposal practices in Ocean County.*

5. *Costs for collection and disposal of residential solid wastes in Ocean County are tabulated in Chapter IV. The estimated per capita costs are calculated with a weighted population figure which compensates for very large population and waste quantities during the ten week*

summer season. These costs are summarized below:

| TYPE OF COLLECTION | NUMBER OF MUNICIPALITIES | RANGE OF ESTIMATED COST PER YEAR PER CAPITA |
|---|---|---|
| Municipal, curbside | 20 | $ 3.34-$31.06 |
| Municipal, backyard | 2 | $10.35-$12.40 |
| Contract, curbside | 6 | $13.48-$16.79 |
| Contract, backyard | 2 | $30.81-$55.14 |
| Private, curbside | 3 | $12.82-$20.63 |

6. The 1974-1975 solid waste quantities in Ocean County were calculated taking into account the summer increase in population and waste generation. The estimates are outlined below:

| COMPONENT | ESTIMATED TONS/YEAR | ESTIMATED AVERAGE TONS/WEEK | ESTIMATED PEAK TONS/WEEK |
|---|---|---|---|
| Residential | 292,500 | 5,625 | 10,500 |
| Non-Residential Municipal | 17,900 | 344 | 500 |
| Commercial | 127,500 | 2,452 | 4,021 |
| Industrial | 99,000 | 1,904 | 2,000 |
| Agricultural | 3,000 | 58 | 100 |
| County Totals | 539,900 | 10,380 | 17,100 |

7. Eleven municipalities engage in some form of recycling

activities. These municipalities are: Beach Haven, Brick, Dover, Jackson, Lakewood, Lavallette, Pine Beach, Point Pleasant, Point Pleasant Beach, Seaside Heights, and South Toms River. The Ocean County Girl Scout Council also is involved in recycling activities. Chapter V describes these activities in detail. The recycling activities in the County could be expanded to other municipalities if a county-wide disposal system was instituted under County guidance. The problems that most often affect local groups are lack of vehicles to haul the recycled materials, lack of labor, and a lack of expertise in marketing the recycled materials. Considerable potential exists for voluntary or mandated source separation of materials at the homeowner level.

8. Until 1970, the local municipality had primary responsibility for solid waste collection and disposal in New Jersey. Recently the trend of legislation has been to place responsibility for solid waste management at the county level of government.

Currently, there are six administrative structures available for regional solid waste management in Ocean County including the following inter-municipal and county-level structures:

| LEGISLATIVE BASIS OF ADMINISTRATIVE STRUCTURE | TYPE OF REGIONAL SOLID WASTE SYSTEM PERMITTED |
|---|---|
| Incinerator Authorities Law of 1948 | One or more municipalities may create Incinerator Authority |
| Solid Waste Management Authorities Law of 1968 | One or more municipalities may create Solid Waste Management Authority |
| Joint Service Contract (N.J.S.A. 49:48B-1) | Joint Meeting between two or more municipalities |
| County Solid Waste Disposal Financing Law | County department or agency |
| County Municipal Utilities Authority Law | County Utilities Authority established by Freeholders |
| County Improvement Authorities Law | County Improvement Authority established by Freeholders |

*A complete description of each of these six administrative structures, together with financial aspects, is presented in Chapter VI. The County Department appears to be the strongest administrative system for the solid waste disposal facility.*

9. *An important aspect of solid waste management involves reducing the ever-increasing volume of solid waste that is discarded each day for disposal. At a time of national energy and material shortages, increased emphasis is being placed on the recovery or recycling of energy and materials from solid waste. In order for a large recycling effort to work effectively, a reliable buyer (market) for the recovered materials must be found.*

As outlined below, Ocean County has large components of potentially recyclable or re-usable materials.

| TYPE OF SOLID WASTE | TYPICAL PERCENTAGE PAPER | METAL | GLASS |
|---|---|---|---|
| Residential | 41% | 11% | 12% |
| Commercial | 45% | 3.9% | 1.7% |
| Industrial | 22.5% | 7.9% | 0.7% |

Chapter VII describes the present market conditions for recovered materials existing in New Jersey. Our research verifies that there currently exists markets for materials such as paper, aluminum, and ferrous metal, in addition to energy which can be derived from processed solid waste.

10. Major new resource recovery and solid waste disposal techniques are under development. The concept of burning and wasting valuable resources and energy is being phased out as more and more resource recovery facilities which reclaim aluminum, ferrous metal, paper and energy, are planned and constructed. Chapter VIII describes in detail the major new methods of solid waste disposal including: shredding-landfilling, pyrolysis, high temperature incineration and the various resource recovery systems available. Resource recovery is considered by experts to be the most promising future method of solid waste disposal.

11. *Chapter IX describes the utilization of transfer stations to reduce costs of solid waste haulage. A transfer station offers increased flexibility in hauling to disposal sites, generally significantly reduces haulage costs, aids the improvement of clean-up services, offers a central facility for use by residents to dispose of bulky goods, and offers a central area for recycling activities.*

    *Costs and a description of transfer station equipment systems are described in Chapter IX. A number of municipalities have potential for economic and service benefits by utilization of a transfer station.*

12. *The management and planning constraints for solid waste management in Ocean County are summarized in Chapter X. Some of these criteria include:*

    - *Public attitudes towards solid waste management.*
    - *Increased solid waste generation.*
    - *Existing solid waste management systems in Ocean County.*
    - *Legal and administrative criteria.*
    - *Markets for resource recovery*
    - *Solid waste disposal technology.*
    - *Costs of a solid waste management system.*
    - *Environmental constraints.*

# I. INTRODUCTION

## THE SOLID WASTE PROBLEM

According to the United States Environmental Protection Agency, some 190 million tons of residential, commercial, and industrial solid wastes were collected nationally in 1969 at an estimated cost of $3.5 billion dollars. Solid waste production in the United States is greater than any other country.

Our society has been conditioned to use disposable products. Because of historically higher costs of labor compared to materials, materials have become relatively expendable in manufacturing and in the household. Great value is placed on new products; hence, broken appliances, toys, furniture, etc. are discarded rather than repaired or reused. As a result of these trends, the per capita quantities of solid waste produced in the County are increasing at an alarming rate. Indications are that the solid waste production rate is increasing at about 2 to 4 percent annually.

As per capita production rates increase, there is a corresponding increase in collection and disposal costs. For example, a recent New Jersey survey found that between 1960 and 1970, municipal expenditure for solid waste collection and disposal increased 156 percent. In addition, stringent new Federal, State and local environmental standards and regulations will force the cost of solid waste collection and disposal even higher. It is predicated that the $3.5 billion spent on collection and disposal at the beginning of this decade can be expected to triple by 1980.

The solid waste collection and disposal problem in New Jersey is probably the most critical than any of the nation's urbanized states. At present, New Jersey is the most densely populated state in the nation. In 1970, the population was 7,172,000; by 1985, the population is expected to increase to over nine million. Ocean County's estimated 1974 population was 257,785. The County's population statistics are tabulated by municipality in Table I-1.

New Jersey is also one of the nation's leading industrial states. The State ranks number one in the Nation in the production of chemicals and allied products and is in the forefront in the manufacture of apparel, instruments, electrical machinery, food products, textiles, and a diversity of other products. This giant industrial complex generates huge quantities of solid wastes which compete with residential, commercial and institutional solid wastes for disposal facilities.

New Jersey's expanding population and industrial and commercial growth means that, each day, more than 12,000 tons of domestic solid waste, 4,000 tons of commercial refuse, and some 17,500

## TABLE I-1.

## POPULATION PATTERNS OF OCEAN COUNTY MUNICIPALITIES

| MUNICIPALITY | 1960 | 1970 | 1974 |
|---|---|---|---|
| Barnegat Light | 287 | 554 | 620 |
| Bay Head | 824 | 1,083 | 1,090 |
| Beach Haven | 1,041 | 1,488 | 1,640 |
| Beachwood | 2,765 | 4,390 | 5,170 |
| Berkeley | 4,272 | 7,918 | 12,270 |
| Brick | 16,299 | 35,057 | 44,795 |
| Dover | 17,414 | 43,751 | 50,185 |
| Eagleswood | 766 | 823 | 860 |
| Harvey Cedars | 134 | 314 | 500 |
| Island Heights | 1,150 | 1,397 | 1,440 |
| Jackson | 5,939 | 18,276 | 21,000 |
| Lacey | 1,940 | 4,616 | 7,560 |
| Lakehurst | 2,780 | 2,641 | 2,930 |
| Lakewood | 16,020 | 25,223 | 32,550 |
| Lavallette | 832 | 1,500 | 1,545 |
| Little Egg Harbor | 847 | 2,972 | 4,675 |
| Long Beach | 1,561 | 2,910 | 3,645 |
| Manchester | 3,779 | 7,550 | 12,835 |
| Mantoloking | 160 | 319 | 315 |
| Ocean Gate | 706 | 1,081 | 1,115 |
| Ocean | 921 | 2,222 | 2,680 |
| Pine Beach | 985 | 1,395 | 1,480 |
| Plumsted | 3,281 | 4,113 | 4,525 |
| Point Pleasant Beach | 3,873 | 4,882 | 4,945 |
| Point Pleasant | 10,182 | 15,968 | 16,760 |
| Seaside Heights | 954 | 1,248 | 1,400 |
| Seaside Park | 1,054 | 1,432 | 1,505 |
| Ship Bottom | 717 | 1,079 | 1,195 |
| South Toms River | 1,603 | 3,981 | 4,240 |
| Stafford | 1,930 | 3,684 | 4,595 |
| Surf City | 419 | 1,129 | 1,275 |
| Tuckerton | 1,536 | 1,926 | 2,265 |
| Union | 1,270 | 1,539 | 4,180 |
| Total | 108,241 | 208,461 | 257,785 |

SOURCE: U. S. Census of Population 1960, 1970
N. J. Office of Business Economics: July 1, 1974 Estimates

PREPARED BY: Ocean County Planning Board: April, 1975 tons of industrial solid wastes are generated and require proper treatment and disposal. Thus, each day, over 33,500 tons of solid waste are discarded for disposal in New Jersey.*

The overwhelming majority of the solid waste in New Jersey, excluding agricultural wastes, are disposed of in landfills located throughout the State. There are a few municipal incinerators that burn a very small fraction of the total waste but they face serious operating difficulties as the State air pollution regulations become more stringent. Most of these incinerators will be forced to install expensive air pollution abatement equipment in the future or close down. The sanitary landfilling will continue to be the predominate method of solid waste disposal until new volume reduction and resource recovery facilities are opened up across the State. Statewide projections indicate that, by 1981-1982, existing landfill capacity will be virtually exhausted. While existing landfill capacity is rapidly being used, efforts to locate new landfill sites have generally been unsuccessful because such solid waste disposal facilities are generally vigorously opposed by local groups.

THE SETTING FOR THE OCEAN COUNTY SOLID WASTE STUDY

Thirty of the 33 municipalities in Ocean County, through tax

*Statewide tonnage estimates are from the "New Jersey State Solid Waste Management Plan", adopted by the New Jersey Department of Environmental Protection (DEP) in 1970.

dollars, provide solid waste collection and disposal services. Some 22 municipalities utilize municipal equipment and manpower for solid waste collection, eight municipalities contract with a private firm for refuse collection. In three municipalities, the residents contract directly with private firms and the municipality has no direct expenditures for solid waste collection. Although the type of collection is varied, all 33 municipalities have their refuse buried in landfills located throughout Ocean and Monmouth Counties.

In the past several years, solid waste disposal has become a serious problem to some areas of Ocean County. The municipal officials of Long Beach Island, Island Beach, and many coastal communities have long recognized the problem. Solid waste disposal costs have escalated as haulage to distant landfill sites increased. Furthermore, the large, heavily populated municipalities in the north, Dover and Brick, have limited landfill capacity remaining and poor prospects for acquiring new landfill areas locally.

The burden of future responsibility for managing the solid waste disposal system in Ocean County appears to be at the county level of government. Recent New Jersey State legislation has specified that the county should be the governmental division to provide and manage adequate, environmentally sound, solid waste disposal facilities.

THE SCOPE OF THE SOLID WASTE STUDY

The Ocean County Board of Chosen Freeholders recognized the problem of increasing solid waste collection and disposal costs, rapidly filling existing landfills, and basic raw material and energy shortages and acted in cooperation with the Ocean County Planning Board to hire M. Disko Associates, an environmental engineering consultant, to develop and formulate a county-wide solid waste management plan. The objectives and scope of the study include the following:

1. To develop a comprehensive regional solid waste management plan for Ocean County's municipalities; a plan that will ensure an area-wide approach with advantages of intergovernmental cooperation.
2. To evaluate the economic and financial aspects of a comprehensive regional solid waste management plan.
3. To enlist citizen and local government support and cooperation with definite roles in plan development and implementation.
4. To formulate the necessary legal rules, standards, and regulations necessary for implementation and operation of the regional plan.
5. To determine the organizational responsibilities, structure, and functions to implement and operate the regional solid waste management plan.
6. To evaluate the technical and environmental aspects of solid waste collection, transfer, processing, and disposal methods for a comprehensive plan.

This report, Volume I, is an inventory of existing solid waste collection and disposal systems in Ocean County, together with detailed background information. A second volume will outline alternatives for a comprehensive Ocean County solid waste management plan.

This report is part of a dynamic planning and implementation process that will require additional data, public education and information programs, and continued and increased efforts on the part of the public officials and private citizens in Ocean County to implement an environmentally sound, county-wide solid waste management system.

## II. ENVIRONMENTAL AND PHYSICAL DESCRIPTION OF OCEAN COUNTY

The natural, physical, and environmental conditions which exist in Ocean County at the present time have substantial importance and impact on the development of a county-wide solid waste management plan. Topics of importance in the planning and engineering process include: geology, topography, soils, drainage, groundwater, climatology, pollution of the air, water, and land, and existing transportation systems.

### GEOLOGY

Ocean County's geologic structure is comprised of 20 individual formations and deposits. These formations consist of components of sand, silt, clay, and gravel. The following breakdown has been made for these various formations and deposits:

| | | | |
|---|---|---|---|
| 1. | Beacon Hill Gravel | 11. | Marshalltown Formation |
| 2. | Bridgeton Formation | 12. | Merchantville Formation |
| 3. | Cape May Formation | 13. | Mount Laurel Sand |
| 4. | Cohansey Sand | 14. | Navasink Formation |
| 5. | Englishtown Formation | 15. | Pensauken Formation |
| 6. | Holocene Series | 16. | Raritan Formation |
| 7. | Hornerstown Sand | 17. | Red Bank Sand |
| 8. | Kirkwood Formation | 18. | Vincentown Formation |
| 9. | Magothy Formation | 19. | Wenonah Formation |
| 10. | Manasquan Formation | 20. | Woodbury Clay |

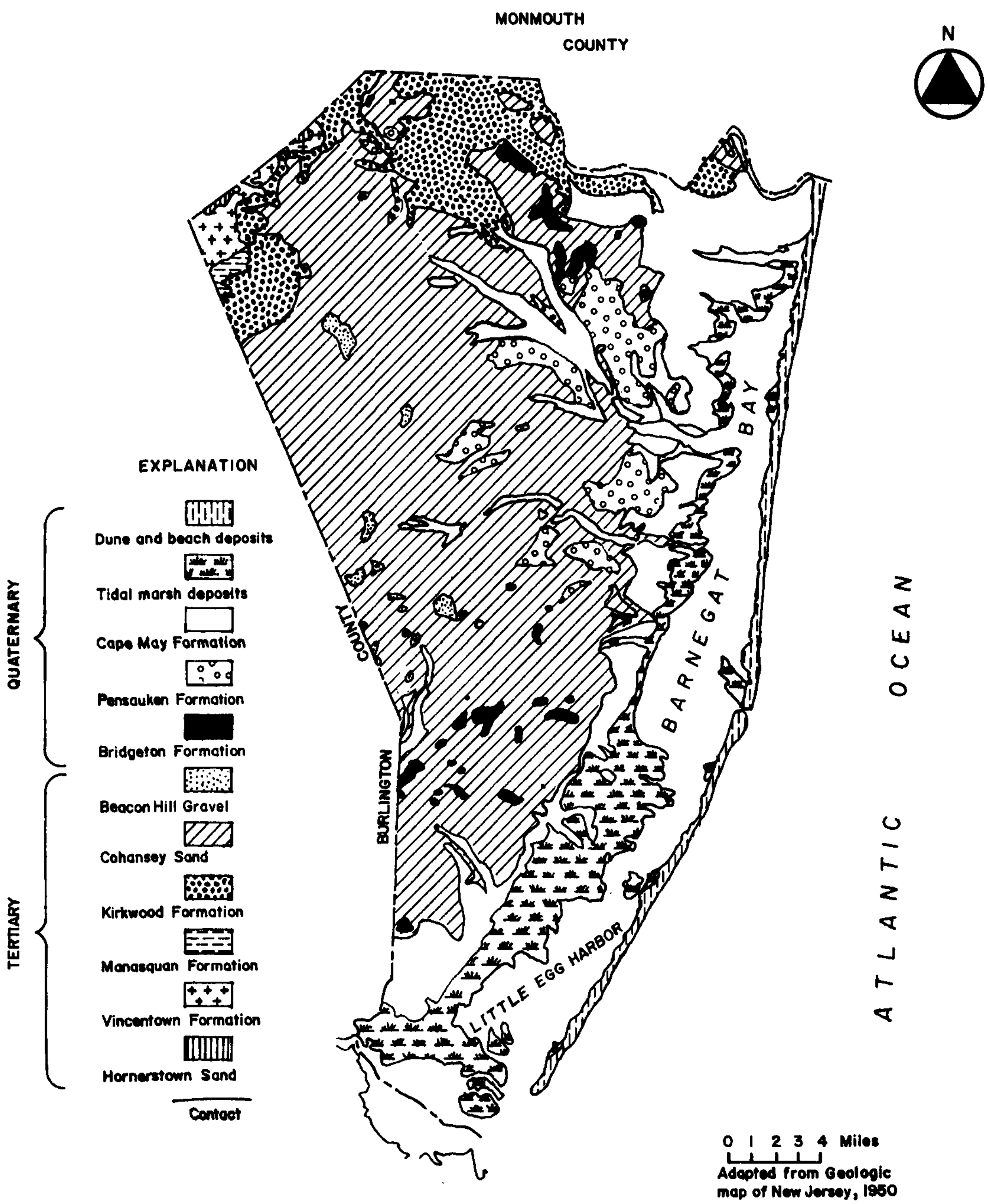
These formations and deposits have been classified in geologic time into three periods: Cretaceous, Tertiary, and Quaternary. Figure II-1 shows the outcropping formations within Ocean County. The Cretaceous Formations are found to lie on gneiss bedrock from the early Paleozoic or Precambrian Era. The bedrock surface has been found to vary from 5000 feet below mean sea level at the southern tip of the County to 1000 feet below mean sea level in the northern parts of Plumsted and Jackson Townships. Elevations of the bedrock surface increase in a southeast to northwest direction from 5000 feet to 1000 feet below mean sea level. This layer of bedrock or basement rock, as it is called because of the unknown depths to which it extends, were formed some 500 million to one billion years ago. Figures II-2 and II-3 show the positioning of these formations along the coast from Sandy Hook to Atlantic City and across the County from Princeton Junction to Barnegat Light.

The formations and deposits below fall into the Cretaceous Epoch of the Mesozoic Era and are listed from earliest to most recent in deposition:

1. Raritan Formation
2. Magothy Formation
3. Merchantville Formation
4. Woodbury Clay
5. Englishtown Formation
6. Marshalltown Formation
7. Wenonah Formation
8. Mount Laurel Sand
9. Navesink Formation
10. Red Bank Sand

# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

## GEOLOGIC OUTCROPPINGS IN OCEAN COUNTY

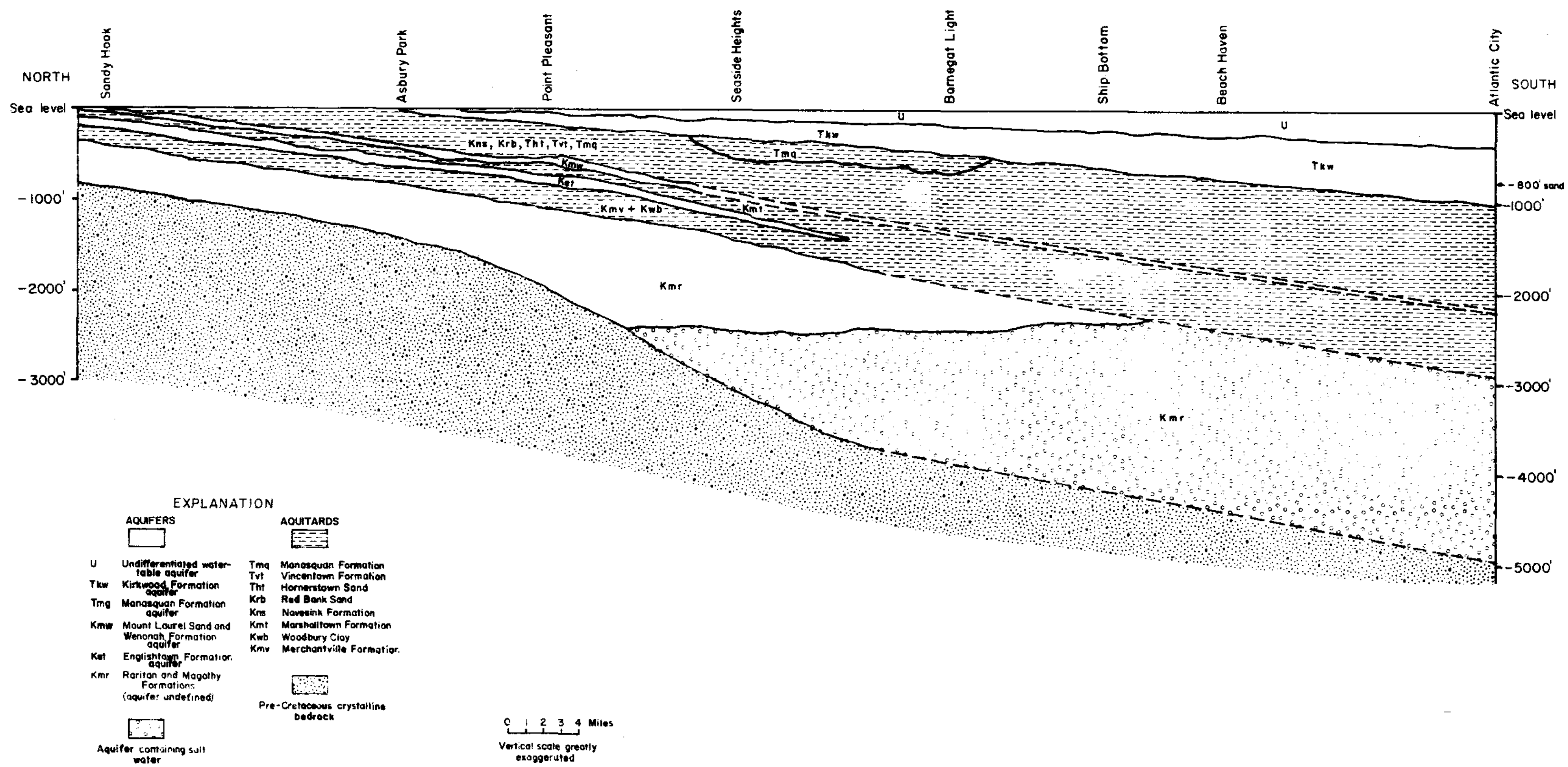



SOURCE: SPECIAL REPORT NO. 29. STATE OF NEW JERSEY DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT

FIGURE II-1
M. DISKO ASSOCIATES
CONSULTING ENGINEERS

# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

## GEOLOGICAL CROSS-SECTION ALONG THE ATLANTIC COAST



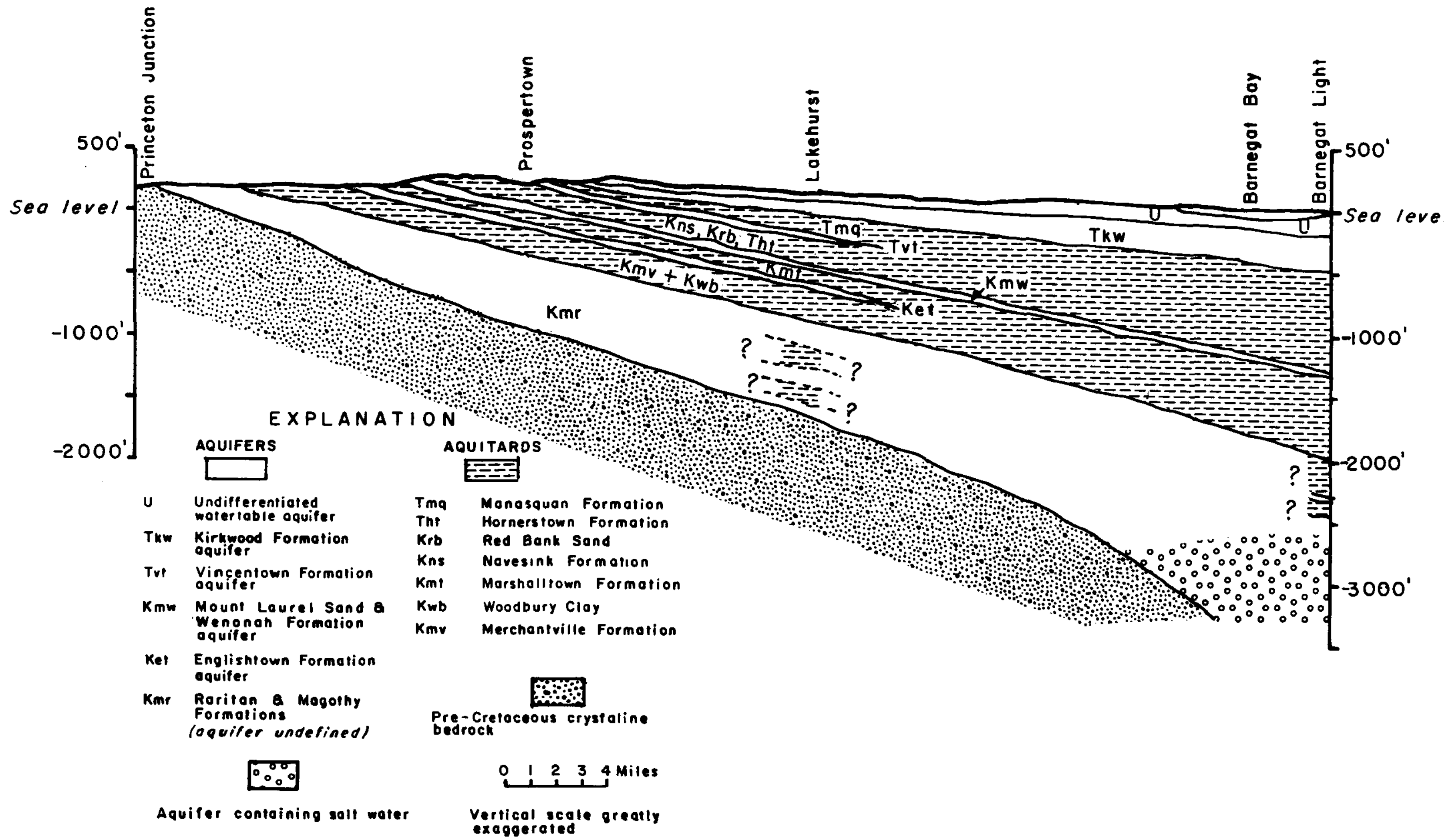

SOURCE: SPECIAL REPORT NO 29 STATE OF NEW JERSEY DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT

FIGURE II-2

M. DISKO ASSOCIATES
CONSULTING ENGINEERS

# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

## GEOLOGICAL CROSS-SECTION ACROSS OCEAN COUNTY




SOURCE: SPECIAL REPORT NO. 29. STATE OF NEW JERSEY DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT

FIGURE II-3

M. DISKO ASSOCIATES
CONSULTING ENGINEERS

These materials were deposited in the period from 60 million to 125 million years ago. The Raritan and Magothy Formations are geologically similar. The Raritan Formation is found to be a light-colored, medium-to-coarse-grained quartz sand, interbedded with vari-colored kaolinitic clay. The Magothy Formation is characteristically a micaceous, fine-grained, lignitic sand which is also interbedded with clay. These two formations form the oldest, deepest, and thickest, unconsolidated unit in the County. They comprise half the thickness of the Coastal Plain sediments.

Over the Magothy Formation is found the Merchantville Formation. The Merchantville Formation is found to be a black or green fossiliferous glauconitic, micaceous clay, silt, or sandy clay. Found in this formation are large quantities of marine fauna, which suggest that deposition was in a shallow water marine environment. Deposited over the Merchantville Formation is the Woodbury Clay. This clay is similar to the Merchantville Formation, but with little or no glauconite present. Woodbury Clay is dark-gray or black non-glauconitic, lignitic, fossiliferous blocky clay with interbedded white sand lenses. Testing has revealed the predominant clay minerals found in Woodbury Clay to consist of kaolinite, chlorite, and mica. The Merchantville Formation and Woodbury Clay are relatively impervious and act as confining layers for aquifers located over them.

The Englishtown Formation represents the next deposition of sandy material within the County. It is found to be a gray micaceous quartz sand. When weathered, it can appear as white, yellow, or brown sand. In areas where cross-bedding occurs, the following materials are found: iron oxide, lignite, pyrite, and clay lenses. In the southern portion of the County, the Englishtown Formation wedges out or grades into a clay material resembling the underlying Woodbury Clay and overlying Marshalltown Formation.

The Marshalltown Formation is found to vary lithologically from a black sandy micaceous glauconite clay to a clayey greensand. It is differentiated from the overlying Wenonah Formation and Mount Laurel Sand by its high glauconite content. This formation was also deposited in a shallow water marine environment as evidenced by large quantities of marine fauna. The overlying Wenonah Formation and Mount Laurel Sand are similar in lithology, with little or no resemblance to the Marshalltown Formation. The Wenonah Formation is generally found as a silt to medium-grained, yellow micaceous and chloritic sand. The Wenonah Formation is found to slowly grade into a glauconitic sand and silt similar in composition to the overlying Mount Laurel Sand. Mount Laurel Sand is a glauconitic, fine-to-coarse-grained quartz sand, which produces a salt and pepper appearance. The Mount Laurel Sand is found to be coarser grained and contain more brown, yellow, and dark green glauconite when in direct contact with the underlying formation. The last two materials deposited during the Cretaceous Epoch were the Navesink Formation and the Red Bank Sand. The Navesink Formation consists of a greenish-black, semi-consolidated, greensand marl. Primarily, it contains fine to coarse-grained, rounded glauconite and some quartz grains. This formation is marine in nature when it was deposited on the continental shelf. Its upper extreme generally contains clay, mica, and pyrite, while the lower extremes are predominated by coarser, more glauconitic materials and quartz pebbles. Red Bank Sand is found to be quite different in composition with its upper layers consisting of yellow or reddish-brown, medium to coarse-grained, micaceous sand, and the lower layers containing dark gray clay material consisting of a clayey, micaceous, fossiliferous, glauconite sand or sandy clay. When found in subsurface areas, the Red Bank Sand resembles the greensand marls of the Navesink Formation.

The next group of materials were deposited during the Tertiary Period from one million to 60 million years ago. The following formations and deposits from the earliest to more recent are:

1. Hornerstown Sand
2. Vincentown Formation
3. Manasquan Formation
4. Kirkwood Formation
5. Cohansey Sand
6. Beacon Hill Gravel
7. Bridgeton Formation
8. Pensauken Formation

The Hornerstown Sand Formation consists of a green semi-consolidated medium to coarse-grained, glauconite sand, silt, and clay. Shell layers are interbedded throughout the formation. Hornerstown Sand is similar to the underlying Navesink Formation, but consists of less clay, large concentrations of glauconite, and is a lighter shade of green.

The next successive formation, the Vincentown Formation, has been found to exist in two distinct units. The lower of the two units consists of a glauconite and quartz sand. Below the water table, it is greenish in color, but when it extends above the water table, the color is altered to yellow. The upper unit is predominantly a lime sand which contains traces of marine organisms. It is clayey, micaceous, glauconitic, calcareous, and fossiliferous in content and grades from a fine to medium-grained quartz sand to a clayey lime sand. The Vincentown Formation is the principle formation of the lowlands of northwestern Ocean County.

The Manasquan Formation which overlies the Vincentown Formation varies in composition along the coast. In Monmouth County, the formation appears in two units, the lower a glauconitic sand and the upper, a fine-grained sand to greenish-white clay. Within Ocean County, the lower unit grades to a dark greenish-gray clayey, glauconitic quartz sand, and the upper becomes a glauconitic quartz sand, silt, and clay. In the area of

Atlantic City, the Manasquan Formation is found to be a greensand marl. Grain size in the Manasquan Formation grades from a coarser-grained sand upward to a fine-grained sand in the Kirkwood Formation.

The Kirkwood Formation is found in two lithologically different units within the County. It is a major formation and can be found throughout the County. Its lower unit consists of a dark-brown, pebbly, lignitic, micaceous, ilmenitic, fine to very fine-grained quartz sand and silt. Drillers have described it as a light-gray to yellow-brown micaceous, ilmenitic, lignitic, very fine to fine-grained quartz sand. Color changes occur when the Kirkwood Formation becomes weathered above the water table. It is then found as being medium gray, yellow-brown, or red-brown in color. The sand of this formation becomes interbedded with thick clays and "shoestring sand" along the coast. This interbedding grades to silt and fine-grained sand as the formation moves inland.

The most widely found surface geologic formation to exist in Ocean County is the Cohansey Sand. It is exposed throughout the County except for areas along the northern and eastern boundaries. Cohansey Sand is primarily a yellowish-brown, cross-stratified, pebbly, fine to very coarse-grained quartz sand. It is locally cemented with iron oxide and can be found to be interbedded with red, white, and dark gray kaolinitic clays. These interbedded materials are believed to be from later Quaternary deposits which washed down into the Cohansey layer.

Beacon Hill Gravel comprises the remaining formation to be included within the Tertiary deposits. The Beacon Hill Gravel is limited within the County and represents the remnants of eroded hilltops in the western portion of the County. It is a mixture of quartz, chert, and rock fragment pebbles, and sand.

The most recent deposits classified in Ocean County are called Quaternary deposits. They consist of the Bridgeton, Pensauken, and Cape May Formation, and the Holocene Series. The Bridgeton Formation is a gravel formed during the last geologic period of the Tertiary deposits. It is divided into two phases, Glassboro and Woodmansie, with the Woodmansie phase being present in Ocean County. It is found on hilltops in the northern and southern portions of the County. As the deposits occur southward, ironstone becomes present and the chert diminishes. The Woodmansie phase differs from the Glassboro phase by the absence of sediments washed from the Piedmont Plateau, inland from the coast.

The final gravel formation, the Pensauken Formation, is lithologically similar to the Bridgeton Formation. Pensauken Gravel is mainly found in the Toms River area and differs from the Bridgeton Formation by the presence of glauconite and by an abundance of ironstone fragments. By following the formation to the southeast, an increase in the quantity of quartz pebbles is observed.

The final two formations associated with Ocean County are the Cape May Formation and the Holocene Series. The Cape May Formation is a type of gravel which can be found as two types of deposits: Terrace and Marine. The Terrace deposits can be found at altitudes as high as 150 feet in inland stream valleys, while the Marine deposits are found at altitudes of less than 50 feet along the coast. In comparison to other gravels found within the County, the Cape May Formation is less compact and does not contain as much weathered chert and iron oxide pebbles as the previously deposited gravels. Findings show much of this gravel was reworked from older deposits.

The most recent deposits in the County are classified as the Holocene Series. This series includes all the beach deposits, swamp and tidal marsh deposits, and stream bed alluvial deposits. The beach deposits form the dunes and barrier beach strip from Point Pleasant to Beach Haven on Long Beach Island. These sedimentary deposits are fairly uniform and consist of typically well sorted, fine to medium-grained quartz sands. The swamp and tidal marsh deposits are composed of silt and clay that is high in organic content. The tidal marsh deposits are found in the salt marshes common to Barnegat Bay, while the swamp deposits are common to the cedar swamps found on the fringes of the inland streams within the County. Lastly, the stream deposits consist of thin sand layers developed from upstream runoff of sediments.

## TOPOGRAPHY

Ocean County is located in the Coastal Plain physiographic province of New Jersey. This province comprises approximately one-half the surface area of New Jersey. Ocean County lies within the outer plain section of the province. This section is part of the Atlantic Plain which was once submerged by the Atlantic Ocean. Elevations within the County vary from mean sea level along the coast to 220 feet above mean sea level along the northwestern border. A few isolated hilltops scattered throughout the County reach an elevation of 200 feet, but the majority of the land is below elevation 150 feet. Much of this low land consists of swamps, streams, and salt marshes.

The most striking topographic feature of the County is the barrier beach which extends from Point Pleasant to the southern end of Long Beach Island. The topographic elevation of this beach is seldom more than 10 feet above mean sea level. Through longshore currents and wave and wind action, dunes are formed along the beach. However, storms of the magnitude of the one which occurred in March 1962 are the most detrimental to this type of barrier beach. Wave action carried large portions of the beach and dunes offshore to form bars and also cut a storm inlet on Long Beach Island. The areas were eventually rebuilt through wave action which moved the sand back to the beach. This cycle will continually change and revise the topography along this portion of the County.

## SOILS

The soils of Ocean County were predominantly deposited during the Tertiary and Quaternary periods in geologic time. These surface soils fall into 14 geologic classes as shown below:

1. Alluvial, Stratified Materials (AM-12)
2. Alluvial, Stratified Materials (AM-23)
3. Alluvial, Stratified Materials (AM-24)
4. Stratified, Recent Alluvium (AR)
5. Marine, Stratified Materials (M-23)
6. Marine, Stratified Materials (M-24)
7. Marine, Stratified Materials (M-27)
8. Marine, Stratified Materials (M-3)
9. Marine, Stratified Materials (MB-13)
10. Gravel Capped, Marine Deposits (ML-12)
11. Gravel Capped, Stratified Marine Deposits (ML-23)
12. Marine Tidal Marsh (MTM)
13. Stratified Materials (MX-2)
14. Stratified Materials (MX-67)

Table II-1 contains information about the characteristics associated with each geologic class. Table II-2 contains a listing of the soil classes occurring in each municipality in Ocean County.

Each of the agronomic series listed in Table II-1 is underlain with soils ranging from fine sand to sandy clay and gravel. Table II-3 lists the general nature of sub-soils underneath the surface soils.

## GROUNDWATER

Groundwater is the term referring to water which exists below the ground surface. Groundwater originates from precipitation, some of which infiltrates into the sub-surface layers.

TABLE II-1

CLASSES OF SURFACE SOIL PRESENT IN OCEAN COUNTY

| SOIL SYMBOL | CORRELATED AGRONOMIC SERIES | TYPE | COLOR | LAYER THICKNESS (inches) | DRAINAGE |
|---|---|---|---|---|---|
| AM-12+ | Lakewood | Sand | White | 6 - 20 | Good to Excellent |
| | | Fine Sand | White | 8 - 12 | |
| | | Sandy Loam | White | 4 - 8 | |
| | Sassafras | Gravelly Sandy Loam | Brownish-Gray | 2 - 4 | |
| | | Coarse Sand | Brownish-Gray or Light Brown | 6 - 8 | |
| | | Sand | Gray to Whitish | 5 - 8 | |
| | | Loamy Sand | Grayish-Brown or Light Brown | 6 - 8 | |
| | | Fine Sand | Grayish-Brown to Light Brown or Brown | 4 - 6 | |
| | | Sandy Loam | Light Brown to Brown | 12 - 15 | |
| | | Fine Sandy Loam | Brown to Slightly Dark Brown | 8 - 10 | |
| | | Loam | Light Brown to Brown | 8 - 10 | |

TABLE II-1, CONTINUED

CLASSES OF SURFACE SOIL PRESENT IN OCEAN COUNTY

| SOIL SYMBOL | CORRELATED AGRONOMIC SERIES | TYPE | COLOR | LAYER THICKNESS (inches) | DRAINAGE |
|---|---|---|---|---|---|
| AM-23+ | Lakewood | See AM-12 | | | |
| | Portsmouth | Sandy Loam | Black | 8 - 10 | Fair to Good |
| | | Loam | Black | 10 - 12 | |
| | Sassafras | See AM-12 | | | |
| AM-24+ | Lakewood | (See AM-12 | | | |
| | Portsmouth | -( | | | |
| | Sassafras | (and AM-23 | | | |
| AR° | Freneau | Loam | Brown to Dark Brown | 8 - 10 | Poor |
| | Portsmouth | See AM-23 | | | |
| | Scranton | Sandy Loam | Black | 8 - 10 | |
| | St. Johns | Sand | Black | 5 - 7 | |
| M-23* | Lakewood | See AM-12 | | | |
| | Leon | Sand | Light Gray | 3 - 5 | Poor |
| | Norfolk | Fine Sand | Grayish-Brown to Brownish-Gray | 3 - 4 | Fair |
| | | Sandy Loam | Gray to Brownish-Gray | 5 - 6 | Fair |

TABLE II-1, CONTINUED

CLASSES OF SURFACE SOIL PRESENT IN OCEAN COUNTY

| SOIL SYMBOL | CORRELATED AGRONOMIC SERIES | TYPE | COLOR | LAYER THICKNESS (inches) | DRAINAGE |
|---|---|---|---|---|---|
| M-23*, cont'd. | Portsmouth | See AM-23 | | | |
| | St. Johns | See AR | | | |
| M-24* | Collington | Sand | Light Brown to Brownish-Gray | 3 - 6 | Poor to Good |
| | | Sandy Loam | Light Brown or Brownish-Gray | 6 - 8 | |
| | | Fine Sandy Loam | Brown | 8 - 10 | |
| | | Loam | Brown to Dark Brown | 8 - 10 | |
| | Norfolk | See M-23 | | | |
| | Portsmouth | See AM-23 | | | |
| | Scranton | See AR | | | |
| M-27* | Collington | See M-24 | | | |
| | Keansburg | Loam | Dark Brown to Black | 8 - 10 | Fair to Imperfect |
| | Shrewsbury | Sandy Loam | Brown or Grayish-Brown | 8 - 10 | |

TABLE II-1, CONTINUED

CLASSES OF SURFACE SOIL PRESENT IN OCEAN COUNTY

| SOIL SYMBOL | CORRELATED AGRONOMIC SERIES | TYPE | COLOR | LAYER THICKNESS (inches) | DRAINAGE |
|---|---|---|---|---|---|
| M-3* | Lakewood | See AM-12 | | | |
| | Leon | See M-23 | | | |
| | Norfolk | See M-23 | | | |
| | Sassafras | See AM-12 | | | |
| | St. Johns | See AR | | | |
| MB-13+ | Coastal Beach | Sand | White | Variable | Good to Excellent |
| ML-12* | Lakewood | See AM-12 | | | |
| ML-23* | Sassafras | See AM-12 | | | |
| MTM | Tidal Marsh | Silty Clay plus Organics | Dark Brown to Black with Variations | Variable | Extremely Poor |
| MX-2+ | Lakewood | See AM-12 | | | |
| | Norfolk | See M-23 | | | |
| | Sassafras | See AM-12 | | | |

TABLE II-1, CONTINUED

CLASSES OF SURFACE SOIL PRESENT IN OCEAN COUNTY

| SOIL SYMBOL | CORRELATED AGRONOMIC SERIES | TYPE | COLOR | LAYER THICKNESS (inches) | DRAINAGE |
|---|---|---|---|---|---|
| MX-67* | Lakewood | See AM-12 | | | |
| | Norfolk | See M-23 | | | |
| | Portsmouth | See AM-23 | | | |
| | Sassafras | See AM-12 | | | |
| | Scranton | See AR | | | |

NOTE: * Deposited during Tertiary Period

+ Deposited during Quaternary Period

o Recent and Continually Accumulating Deposits

SOURCE: "Engineering Soil Survey of New Jersey, Report Number 8, Ocean County", Rutgers University, Engineering Research Bulletin Number 22, 1953

TABLE II-2

SOIL CLASSES OCCURRING IN MUNICIPALITIES IN OCEAN COUNTY

| MUNICIPALITY | SOIL CLASS |
|---|---|
| Borough of Barnegat City | MB-13, MTM |
| Borough of Bay Head | AM-23, AM-24, MB-13 |
| Borough of Beach Haven | MB-13, MTM |
| Borough of Beechwood | AM-12, AM-23, M-23, MTM, MX-67 |
| Township of Berkeley | AM-12, AM-23, AM-24, AR, M-23, M-3, MB-13, ML-12, MTM, MX-2, MX-67 |
| Township of Brick | AM-12, AM-23, AM-24, AR, M-23, M-24, M-3, MB-13, ML-12, MTM, MX-2, MX-67 |
| Township of Dover | AM-12, AM-23, AM-24, AR, M-23, M-3, ML-12, MTM, MX-2, MX-67 |
| Township of Eagleswood | AM-12, AM-23, AR, M-23, M-24, MTM, MX-2 |
| Boro of Harvey Cedars | MB-13, MTM |
| Boro of Island Heights | M-23, MTM |
| Township of Jackson | AM-12, AR, M-23, M-24, M-3, ML-12, ML-23, MX-2, MX-67 |
| Township of Lacey | AM-12, AM-23, AM-24, AR, M-23, M-3, ML-12, MTM, MX-2, MX-67 |
| Borough of Lakehurst | AM-12, AR, M-23, M-3 |
| Township of Lakewood | AM-12, AM-23, AM-24, AR, M-23, M-3, ML-12, MX-2, MX-67 |
| Borough of Lavallette | MB-13, MTM |
| Township of Little Egg Harbor | AM-12, AM-23, AM-24, AR, M-23, M-3, MTM, MX-2 |
| Township of Long Beach | MB-13, MTM |
| Township of Manchester | AM-12, AM-23, AR, M-23, M-24, M-3, ML-12, MX-2, MX-67 |
| Borough of Mantoloking | MB-13, MTM |
| Township of Ocean | AM-12, AM-23, AM-24, AR, M-23, M-3, ML-12, MTM, MX-2 |
| Borough of Ocean Gate | AM-12, AM-24, M-23 |
| Borough of Pine Beach | AM-12, AM-23, M-23, MTM |
| Township of Plumsted | AM-12, AM-23, AR, M-23, M-24, M-27, M-3, ML-12, M-23, MX-2, MX-67 |
| Borough of Point Pleasant | AM-12, AM-23, AM-24, ML-12, MTM |

TABLE II-2, CONTINUED

| MUNICIPALITY | SOIL CLASS |
|---|---|
| Borough of Point Pleasant Beach | AM-23, AM-24, MB-13 |
| Borough of Seaside Heights | MB-13, MTM |
| Borough of Seaside Park | MB-13, MTM |
| Borough of Ship Bottom-Beach Arlington | MB-13, MTM |
| Borough of South Toms River | AM-12, AR, M-3, M-23, MTM, MX-67 |
| Township of Stafford | AM-12, AM-23, AM-24, AR, M-23, M-24, M-3, MB-13, MTM, MX-2 |
| Borough of Surf City | MB-13, MTM |
| Borough of Tuckerton | AM-12, AM-24, AR, M-3, MTM |
| Township of Union | AM-12, AM-23, AM-24, AR, M-23, M-24, M-3, ML-12, MTM. MX-2, MX-67 |

## TABLE II-3

## DESCRIPTION OF SUB-SURFACE SOILS IN OCEAN COUNTY

| CORRELATED AGRONOMIC SERIES | DESCRIPTION OF SUB-SOIL UNDER SURFACE LAYER |
|---|---|
| Collington Sand | Reddish-yellow sand with varying amounts of greensand |
| Collington Sandy Loam | Reddish-yellow sand to greenish-yellow sandy clay |
| Collington Fine Sandy Loam | Reddish-yellow fine sandy loam to sandy loam to reddish-yellow sandy clay with considerable greensand |
| Collington Loam | Reddish-brown heavy loam to clay loam |
| Freneau Loam | Mottled rusty-brown, brown, and black loam to black or mottled black, bluish, and greenish loam to dark bluish green and black sandy loam or mottled bluish, greenish, and rusty-brown loam, sandy loam, or silt loam |
| Keansburg Loam | Gray silty clay to sandy clay to greenish or bluish-gray silty clay to sandy clay to green silty clay to sandy clay with yellow & reddish-brown mottling |
| Lakewood Sand | Orange sand |
| Lakewood Fine Sand | Orange fine sand to yellow or pale-yellow fine sand |
| Lakewood Sandy Loam | Yellow or orange-yellow loamy sand to reddish-yellow, orange-yellow, or yellow sandy loam to sandy clay to yellow friable sandy clay |
| Leon Sand | White sand to compacted dark-brown or coffee-brown sand to orange or yellow sand or loamy sand |
| Norfolk Fine Sand | Yellow or pale-yellow fine sand |
| Norfolk Sandy Loam | Yellow friable sandy clay to yellow sandy clay |
| Portsmouth Sandy Loam | Whitish sandy loam to sandy clay with gravel and increased sand content |
| Portsmouth Loam | Whitish sandy loam to sandy clay |

TABLE II-3, CONTINUED

DESCRIPTION OF SUB-SURFACE SOILS IN OCEAN COUNTY

| CORRELATED AGRONOMIC SERIES | DESCRIPTION OF SUB-SOIL UNDER SURFACE LAYER |
|---|---|
| Sassafras Gravelly - Sandy Loam | Reddish-yellow gravelly sandy loam to gravelly sandy loam or gravelly sandy clay to gravel and sand or coarse sand and sand |
| Sassafras Coarse Sand | Yellow or reddish-yellow gravelly coarse sand |
| Sassafras Sand | Brownish-gray sand to orange or reddish-yellow slightly loamy sand |
| Sassafras Loamy Sand | Reddish-yellow loamy sand |
| Sassafras Fine Sand | Orange fine sand to slightly reddish-yellow fine sand, gravel, and medium or coarse sand |
| Sassafras Sandy Loam | Yellow or reddish-yellow loamy sand or sandy loam to yellow or reddish-yellow sandy clay to reddish-yellow sandy clay with gravel and coarse sand |
| Sassafras Fine Sandy Loam | Yellow loamy fine sand or fine sandy loam to reddish-yellow, friable, heavy fine sandy loam or fine sandy clay to reddish-yellow or orange friable sandy clay |
| Sassafras Loam | Reddish-yellow friable loam to dull red to yellowish-red friable sandy clay with fine gravel and sand |
| Scranton Sandy Loam | Yellow or orange-yellow sandy loam or friable sandy clay |
| Shrewsbury Sandy Loam | Mottled greenish, yellow, bluish-gray, and reddish-yellow sandy clay to heavier sandy clay of mottled greenish, yellowish, and reddish colors |
| St. Johns Sand | Dark-brown, compacted sand to dingy orange-yellow sand |

Eventually, groundwater is discharged to streams carrying surface water to the ocean and the hydrologic cycle begins again. Within Ocean County, the existing geologic formations, either singly or in groups, form eight water-producing aquifers. In addition to the formations which contain the aquifers, four formations are present which act to confine and separate underlying aquifers from overlying ones.

The most widely developed aquifer in Ocean County lies within the Kirkwood Formation. The Kirkwood Formation provides all of the public water supply to residents of Long Beach Island and a portion of the water for public use northward to Point Pleasant. Forty-four public supply wells from Long Beach Island to Point Pleasant ranged in yield from 38 to 1225 GPM, with an average yield of 417 GPM. Due to the large demand on this aquifer, water levels have dropped as much as 30 feet in the southern portion of the County. Before large-scale development in this area, wells were artesian in nature and produced static levels of 50 feet or more above sea level. The average withdrawal on a yearly basis is 5 MGD, with the major withdrawals occurring during the summer months.

One water-table aquifer comprising the Cohansey Sand, the Beacon Hill Gravel, and the Bridgeton, Pensauken, and Cape May Formations, is an important future groundwater source. At this time, the water-table aquifer is only moderately tapped in the

Toms River and Lakehurst areas and, to a lesser degree, on the bayside coast of the County. Of the principle groundwater formations, the Cohansey Sand forms the thickest layer. The remaining formations, which are primarily gravel, act as permeable receptors which transmit groundwater for recharge to the saturation zone. Data collected for Toms River and Lakehurst for 30 industrial and public supply wells showed that yields ranged from 65 to 665 GPM, with an average yield of 323 GPM. The industrial and public supply wells account for an average withdrawal of 4 MGD, while the domestic wells tapping the aquifer average 2.5 MGD.

The largest aquifer, by volume, located on the Atlantic Coastal Plain, consists of the Raritan and Magothy Formations. However, this water is mainly held in storage within Ocean County because of the depth of the Formation. A depth of approximately 600 feet below the ground surface to the top of the Magothy Formation makes well drilling feasible to only large industry and public supply sources. The Glidden Company in Lakehurst has drilled wells which tap the entire 900 feet on the Raritan and Magothy Formations. From these wells, three separate aquifers were located: 1) an upper aquifer from 850 to 970 feet, 2) a middle, and the most productive aquifer, from 1280 to 1480 feet, and 3) a lower and the least productive aquifer just above bedrock from 1600 to 1728 feet below existing ground. Of the approximately 5 MGD withdrawn from the Formation, the Glidden wells account for the majority of it. Yields for wells tapping the Formation range from 35 to 1850 GPM, with an average yield of 660 GPM.

The remaining productive aquifers are found in the Englishtown Formation, the Wenonah Formation and the Mt. Laurel Sand, the Manasquan Formation, and the Vincentown Formation. The Englishtown Formation contains the fourth largest aquifer in the County. Artesian conditions exist for this aquifer, with recharge coming mainly from vertical leakage through overlying formations. From the records of wells tapping this formation, yields ranged from 19 to 503 GPM, with an average yield of 260 GPM. A combination of the Wenonah Formation and the Mt. Laurel Sand houses one aquifer. One aquifer is formed because of the similar porosities of the sands which make up the Formations. No well tapped in this aquifer yields greater than 100 GPM, with the average yield for public supply wells being 70 GPM.

Both the Manasquan and Vincentown Formations are considered minor aquifers. The Manasquan Formation provides water to the Seaside Heights, Seaside Park, and Barnegat Light Water Companies. From six wells, an average yield of 260 GPM is obtained. Less than 1 MGD is withdrawn from the Formation. The Vincentown Formations yields only limited water in the vicinity of its outcrop from New Egypt to Bennetts Mills. Domestic wells in this area yield less than 50 GPM, with small specific capacities relating to drawdown. One other formation, the Red Bank Sand, is so small in quantity that only a few wells tap it.

The remaining geologic formations, which consist of 1) Merchantville Formation and the Woodbury Clay, 2) the Marshalltown Formation, 3) the Navesink Formation, and 4) the Hornerstown Sand, all form confining layers to the existing aquifers in the County. Due to the impervious materials contained within each formation, they form seals which prevent seepage or leakage of water from one aquifer to another. The Merchantville Formation and Woodbury Clay confines aquifers in the Raritan, Magothy, and Englishtown Formations. The Marshalltown Formation confines aquifers in the Englishtown and Wenonah Formations, and the Mt. Laurel Sand. The Navesink Formation confines aquifers in the Vincentown and Wenonah Formations and the Mt. Laurel Sand. The Hornerstown Sand, which is similar to the Navesink Formation, confines aquifers in the Magothy and Kirkwood Formations.

## WATER SUPPLY

Domestic and industrial water supply within the County comes entirely from groundwater sources. Records of the New Jersey Bureau of Water Supply show a total of 45 water companies or agencies supplying water to the County. These 45 water companies operate a total of 142 groundwater wells within the County. All of the groundwater used is treated in some manner to meet potable water standards. This treatment can be as simple as pH adjustment and chlorination or as complex as aeration, flocculation, sedimentation, filtration, iron removal, pH adjustment, chlorination, etc. Of these 45 water companies, only two purchase water for use in their distribution area. Long Beach Township Water Department makes daily purchases from Surf City, Harvey Cedars, and Barnegat Light, while the Stafford Township M.U.A. makes purchases from Ship Bottom. Table II-4 gives a listing of data pertinent to each water company. In addition to these water companies, numerous privately-owned wells exist throughout the County.

## DRAINAGE

Surface drainage for the inland portion of Ocean County is accomplished through 11 minor drainage basins: Cedar Creek, Crosswicks Creek, Forked River, Kettle Creek, Manasquan River, Metedeconk River, Mullica River, Rancocas Creek - North Branch, Sloop Creek, Toms River, and Wading River. Figure II-4 shows the extent of each basin within Ocean County. The majority, 87 percent, of Ocean County lies within the Atlantic Coastal Basin, the major drainage basin for southern and coastal New Jersey. The remaining drainage area, handled by Crosswicks Creek and the Rancocas Creek - North Branch, lies within the Delaware River Basin. The following is a breakdown of the individual drainage areas for each of the minor drainage basins within the County in square miles:

TABLE II-4

EXISTING WATER COMPANIES SUPPLYING POTABLE WATER TO OCEAN COUNTY

| WATER COMPANY | MUNICIPALITY | NUMBER OF WELLS | TOTAL EFFECTIVE CAPACITY (MGD) | NUMBER OF SERVICES | ESTIMATED POPULATION SERVED |
|---|---|---|---|---|---|
| Barnegat Light Water Department | Barnegat Light Borough | 2 | 1.68 | 1,200 | W - 650 |
| New Jersey Water Company | Bay Head Borough | 6 | 3.66 | 6,600 | 3,200 |
| Beach Haven Water Department | Beach Haven Borough | 2 | 2.23 | 1,700 | 3,000 |
| Beachwood Water Department | Beachwood Borough | 2 | 1.01 | 1,550 | 3,700 |
| Arlington Beach Water Department | Berkeley Township | 1 | 0.096 | 140 | 500 |
| Berkeley Water Company | Berkeley Township | 2 | 0.54 | 1,100 | 4,000 |
| Shore Water Company | Berkeley Township | 1 | 0.72 | 900 | S - 4,000<br>Average - 300 |
| Brick Township MUA | Brick Township | 10 | 5.34 | 5,200 | 20,000 |
| Brick Township Shore Acres Supply | Brick Township | 1 | 0.144 | 215 | - |

TABLE II-4, CONTINUED

EXISTING WATER COMPANIES SUPPLYING POTABLE WATER TO OCEAN COUNTY

| WATER COMPANY | MUNICIPALITY | NUMBER OF WELLS | TOTAL EFFECTIVE CAPACITY (MGD) | NUMBER OF SERVICES | ESTIMATED POPULATION SERVED |
|---|---|---|---|---|---|
| Hollywood Manor Water Company | Brick Township | 2 | 0.83 | 736 | 2,500 |
| Toms River Water Company | Dover Township | 16 | 12.80 | 16,890 | 58,000 |
| Harvey Cedars Water Department | Harvey Cedars Borough | 2 | 1.44 | 800 | W - 225 |
| Island Heights Water Department | Island Heights Borough | 2 | 1.23 | 705 | 1,400 |
| Jackson Township MUA | Jackson Township | 5 | 2.2 | 2,940 | 11,000 |
| Pleasant Gardens South | Jackson Township | 1 | 0.1 | 10 | 20 |
| Garden State Parkway - Forked River Service Area | Lacey Township | 2 | 0.43 | - | 100,000 |
| Lakehurst Water Department | Lakehurst Borough | 8 | 0.84 | 1,000 | 3,500 |
| New Jersey Water Company, Lakewood District | Lakewood Township | 6 | 5.12 | 4,700 | 23,300 |

TABLE II-4, CONTINUED

EXISTING WATER COMPANIES SUPPLYING POTABLE WATER TO OCEAN COUNTY

| WATER COMPANY | MUNICIPALITY | NUMBER OF WELLS | TOTAL EFFECTIVE CAPACITY (MGD) | NUMBER OF SERVICES | ESTIMATED POPULATION SERVED |
|---|---|---|---|---|---|
| South Lakewood Water Company | Lakewood Township | 5 | 2.90 | 4,010 | 8,400 |
| Lavallette Water Department | Lavallette Borough | 3 | 2.36 | 1,885 | 2,200 |
| Mystic Islands Water Company | Little Egg Harbor Township | 3 | 1.93 | 3,000 | W - 2,000<br>S -10,000 |
| Long Beach Twp. Water Department | Long Beach Township | 1 plus bulk purchases | 1.00 | 1,566 | - |
| Long Beach Water Company | Long Beach Township | 5 | 5.0 | 4,335 | 5,000 |
| Cedar Glen Homes | Manchester Township | 3 | 0.18 | 564 | 900 |
| Cedar Glen Lakes Water Company | Manchester Township | 2 | 1.58 | 581 | 1,100 |
| Cedar Glen West, Inc. | Manchester Township | 3 | 0.63 | 826 | 1,500 |
| Crestwood Village Water Company | Manchester Township | 6 | 2.9 | 2,855 | 4,853 |
| Leisure Community Water Company | Manchester Township | 2 | 0.72 | 300 | 540 |

TABLE II-4, CONTINUED

EXISTING WATER COMPANIES SUPPLYING POTABLE WATER TO OCEAN COUNTY

| WATER COMPANY | MUNICIPALITY | NUMBER OF WELLS | TOTAL EFFECTIVE CAPACITY (MGD) | NUMBER OF SERVICES | ESTIMATED POPULATION SERVED |
|---|---|---|---|---|---|
| Ocean Gate Water Department | Ocean Gate Borough | 3 | 0.92 | 1,070 | 1,081 |
| Indian Surf Beach Water Company | Ocean Township | 2 | 0.45 | 1,000 | 3,000 |
| Mid-Jersey Water Company | Ocean Township | 1 | 0.28 | 248 | 900 |
| Pine Beach Water Company | Pine Beach Borough | 1 | 0.76 | 650 | 1,350 |
| New Egypt Water Company | Plumsted Township | 1 | 0.35 | 450 | 1,500 |
| Point Pleasant Borough Water Department | Point Pleasant Borough | 5 | 3.9 | 6,650 | 16,500 |
| Point Pleasant Beach Water Department | Point Pleasant Beach Borough | 3 | 3.9 | 3,336 | 4,900 |
| Seaside Heights Water Department | Seaside Heights Borough | 3 | 2.88 | 3,585 | 2,800 |

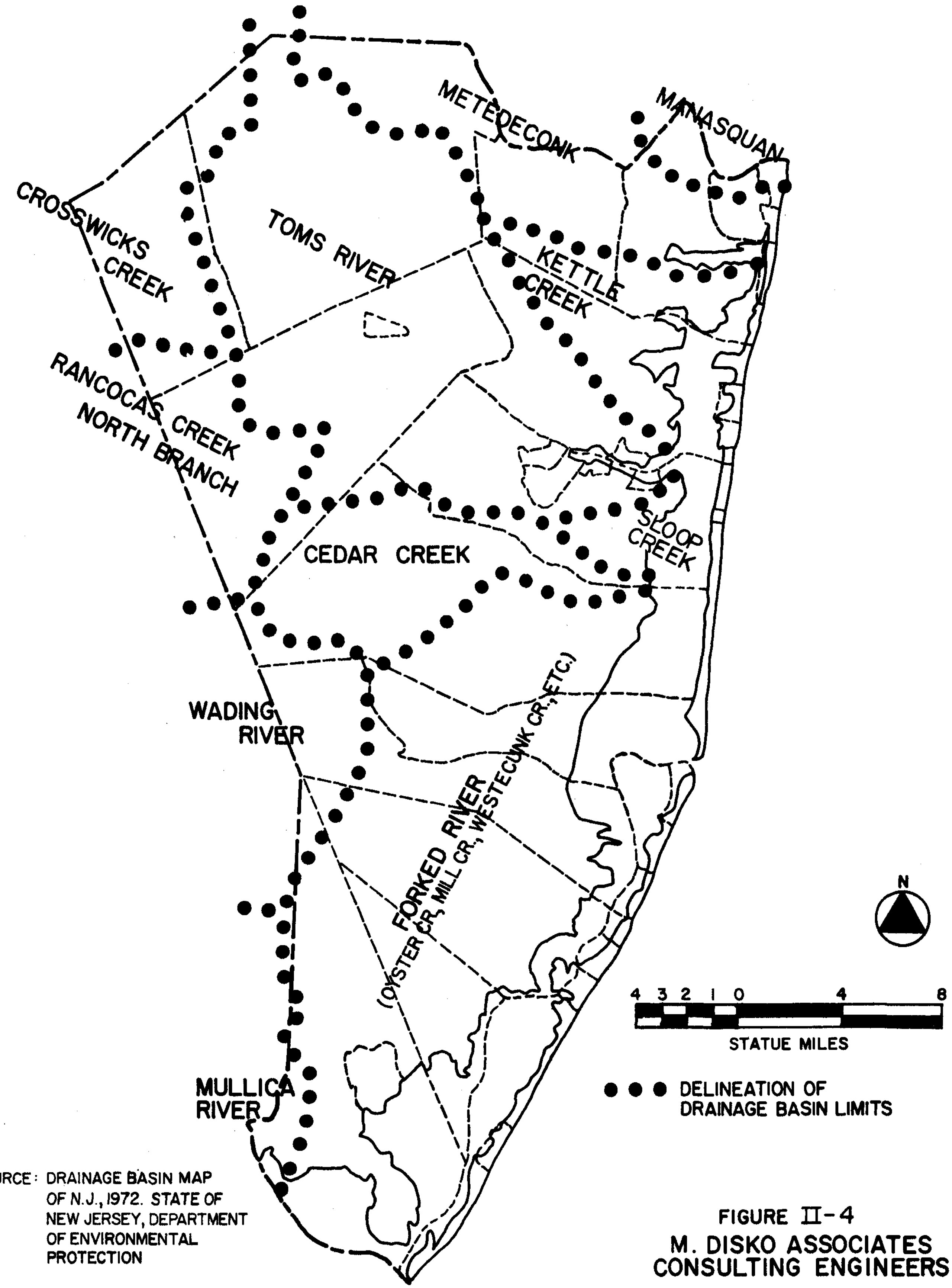
TABLE II-4, CONTINUED

EXISTING WATER COMPANIES SUPPLYING POTABLE WATER TO OCEAN COUNTY

| WATER COMPANY | MUNICIPALITY | NUMBER OF WELLS | TOTAL EFFECTIVE CAPACITY (MGD) | NUMBER OF SERVICES | ESTIMATED POPULATION SERVED |
|---|---|---|---|---|---|
| Seaside Park Water Department | Seaside Park Borough | 4 | 1.54 | 1,680 | 1,450 |
| Island Beach State Park | Seaside Park Borough | 2 | 0.59 | - | 1,800 - Avg. Day<br>4,000 - Max. Day |
| Ship Bottom Water Department | Ship Bottom Borough | 2 | 1.8 | 15,051 | 1,200 |
| Stafford Township MUA | Stafford Township | Bulk Purchase | 0.001 | S - 83<br>W - 20 | S - 250 |
| Stafford Water Company | Stafford Township | 2 | 1.82 | 2,630 | W - 2,000<br>S - 12,000 |
| Surf City Water Department | Surf City Borough | 3 | 2.25 | 1,860 | W - 1,350<br>S - 10,000-15,000 |
| Tuckerton Water Corporation | Tuckerton Borough | 2 | 1.08 | 1,350 | 3,200 |
| Barnegat Water Company | Union Township | 2 | 1.51 | 530 | 2,000 |

# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

## MAJOR SURFACE WATER DRAINAGE BASINS IN OCEAN COUNTY




SOURCE: DRAINAGE BASIN MAP OF N.J., 1972. STATE OF NEW JERSEY, DEPARTMENT OF ENVIRONMENTAL PROTECTION

FIGURE II-4

M. DISKO ASSOCIATES
CONSULTING ENGINEERS

| Drainage Basin | Area in Square Miles |
|---|---|
| Cedar Creek | 35.8 |
| Crosswicks Creek | 40.2 |
| Forked River | 188.0 |
| Kettle Creek | 18.0 |
| Manasquan River | 6.4 |
| Metedeconk River | 59.0 |
| Mullica River | 4.8 |
| Rancocas Creek - North Branch | 37.0 |
| Sloop Creek | 6.1 |
| Toms River | 189.5 |
| Wading River | 27.2 |

Not included in the above list is the drainage from the barrier beach which runs from Point Pleasant to Beach Haven on Long Beach Island. No values are included because drainage area exists in individual small segments which drain to either the bay or ocean. Runoff is also low in this area due to the permeable nature of the sand which comprises the area. The bulk of the County, 61 percent, is drained by Toms River and Forked River. Along with Cedar Creek, these 3 basins drain the southern, southeastern, and central portions of the County. The Mullica and Wading Rivers, Crosswicks Creek, and the Rancocas Creek - North Branch drain the western edge of the County. The remaining basins of the Manasquan and Metedeconk Rivers and Kettle and Sloop Creeks drain the northern and northeastern portion of the County.

## CLIMATE

Ocean County is located between longitudes 74°33'W and 74°02'W, and latitudes 40°10'N and 39°30'N. The County experiences a climate of moderate temperatures and rainfall. With its location along the coast, fluctuations in temperature and rainfall can occur due to offshore factors. Severe storms, such as the one in March 1962, can have disastrous effects on the County, especially along the coast. Table II-5 gives a summary of temperature and rainfall data for four weather stations located in or near Ocean County. This data shows the consistence in climate throughout the County. Figure II-5 shows the speed, wind direction, and frequency of wind patterns which affect Ocean County. By examination, the wind roses for Philadelphia, Allentown, Newark, and Atlantic City show a predominantly northwesterly wind over the County.

MUNICIPAL WASTEWATER TREATMENT FACILITIES

The 33 municipalities of Ocean County are serviced by 41 existing municipal wastewater treatment facilities. These facilities are capable of treating 25 million gallons per day. Of the 41 facilities, 12 furnish primary treatment, 26 furnish secondary treatment, and 3 furnish teritiary treatment. The County is divided into 5 regions with respect to wastewater treatment. These are: 1) Metedeconk River Region, 2) Toms River Region, 3) Forked River-Cedar Creek Region, 4) Mill Creek Region, and 5) Southern Ocean County Region. Table II-6 contains a breakdown of the existing treatment facilities by region and municipality.

At the present time, plans are being developed to incorporate these treatment facilities into a regional system. Through

TABLE II-5

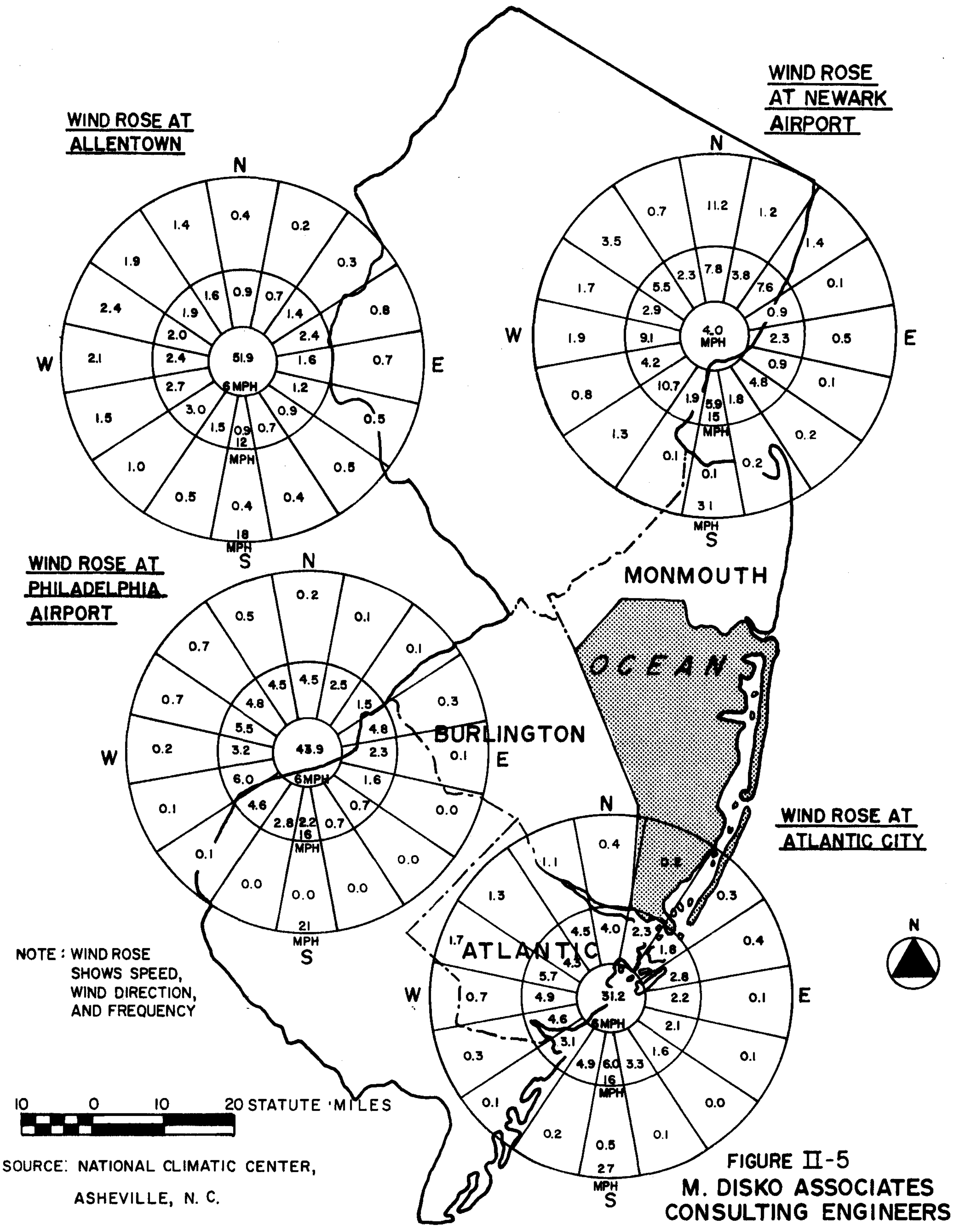
SEASONAL TEMPERATURE AND RAINFALL DATA FOR WEATHER STATIONS IN OR NEAR OCEAN COUNTY, 1973

| PARAMETER | STATION NAME | JANUARY-MARCH | APRIL-JUNE | JULY-SEPTEMBER | OCTOBER-DECEMBER | YEARLY AVERAGE |
|---|---|---|---|---|---|---|
| Temperature, $^{o}F$ | Freehold | 36.5 | 60.1 | 72.5 | 47.1 | 54.1 |
| | Pemberton | 37.8 | 60.8 | 72.1 | 48.0 | 54.7 |
| | Toms River | 37.0 | 60.5 | 72.6 | 46.6 | 54.2 |
| | Tuckerton | 37.8 | 60.6 | 73.4 | 48.5 | 55.1 |
| Rainfall, inches | Freehold | 3.97 | 5.33 | 1.88 | 5.27 | 49.36 |
| | Pemberton | 3.60 | 5.27 | 3.09 | 4.17 | 48.40 |
| | Toms River | 4.51 | 5.58 | 3.58 | 4.07 | 53.26 |
| | Tuckerton | 3.68 | 5.52 | 3.71 | 3.25 | 48.45 |

SOURCE: U.S. Department of Commerce
National Oceanic and Atmospheric Administration
Environmental Data Service
New Jersey Annual Summary 1973
National Climatic Center
Asheville, North Carolina

# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

## WIND VELOCITY AND FREQUENCY FOR OCEAN COUNTY




SOURCE: NATIONAL CLIMATIC CENTER, ASHEVILLE, N. C.

FIGURE II-5

M. DISKO ASSOCIATES
CONSULTING ENGINEERS

regionalization, many of the smaller plants would be abandoned, with their wastes being pumped to a regional treatment facility. Regionalization in the County is viewed for three major areas: 1) Northern Service Area, 2) Central Service Area, and 3) Southern Service Area. Each of these areas would be sewered to transport wastewaters to large regional treatment facilities. By taking this approach, the small streams and tributaries in the County would become free of discharges from the existing smaller facilities.

TABLE II-6

EXISTING WASTEWATER TREATMENT FACILITIES BY REGION AND MUNICIPALITY

| REGION | MUNICIPALITY | NUMBER OF FACILITIES | DEGREE OF TREATMENT | | | TOTAL DESIGN FLOW (MGD) |
|---|---|---|---|---|---|---|
| | | | PRIMARY | SECONDARY | TERTIARY | |
| Metedeconk River | Bay Head | 1 | 1 | - | - | 0.5 |
| | Brick Township | 4 | - | 4 | - | 0.115 |
| | Jackson Township | 4 | - | 4 | - | 0.744 |
| | Lakewood Township | 2 | - | 2 | - | 2.2 |
| | Point Pleasant | 1 | - | 1 | - | 0.022 |
| | Point Pleasant Beach | 1 | 1 | - | - | 1.5 |
| Toms River | Lakehurst | 1 | - | 1 | - | 0.3 |
| | Manchester Township | 2 | 1 | 1 | - | 0.6 |
| | Berkeley Township | 1 | - | 1 | - | 0.5 |
| | Dover Township | 5 | - | 4 | 1 | 11.834 |
| | Lavallette | 1 | 1 | - | - | 0.868 |
| | Seaside Heights | 1 | 1 | - | - | 1.7 |
| | Seaside Park | 1 | 1 | - | - | 0.96 |
| | Island Heights | 1 | - | 1 | - | 0.4 |
| | Jackson Township | 1 | - | 1 | - | 0.021 |

TABLE II-6, CONTINUED

EXISTING WASTEWATER TREATMENT FACILITIES BY REGION AND MUNICIPALITY

| REGION | MUNICIPALITY | NUMBER OF FACILITIES | DEGREE OF TREATMENT PRIMARY | SECONDARY | TERTIARY | TOTAL DESIGN FLOW (MGD) |
|---|---|---|---|---|---|---|
| Forked River - Cedar Creek | Berkeley Township | 3 | - | 3 | - | 0.76 |
| | Lacey Township | 2 | 1 | 1 | - | 0.046 |
| Mill Creek | Ocean Township | 2 | - | 1 | 1 | 0.185 |
| | Stafford Township | 1 | - | 1 | - | 0.314 |
| | Ship Bottom | 1 | 1 | - | - | 1.2 |
| | Surf City | 1 | 1 | - | - | 0.722 |
| Southern Ocean County | Tuckerton | 1 | - | 1 | - | 0.5 |
| | Little Egg Harbor Township | 1 | - | 1 | - | 0.308 |
| | Beach Haven | 1 | 1 | - | - | 0.6 |
| | Long Beach Township | 1 | 1 | - | - | 2.0 |

SOURCE: Environmental Assessment Report
On The Proposed Sewerage Facilities
Of The Ocean County Sewerage Authority
Volume 1, Table IID-1

EXISTING HIGHWAY AND TRANSPORTATION SYSTEMS

The existing highway system in Ocean County has an important influence on the cost of hauling solid waste from the collection point to the disposal facility, and is one of the key factors in disposal site selection. Haulage cost are related to the type of roads available, the existing traffic flow pattern, and the number of vehicles using the particular roadways. Ocean County presently has approximately 2100 miles of state highways, county and municipal roads, including a section of the Garden State Parkway within its boundaries.

Traffic flow in the North-South direction is handled by a number of highways. Two main routes, the Garden State Parkway and U. S. Highway 9 run entirely through the County in a North-South direction. Truck traffic is permitted along the Garden State Parkway in Ocean County. U. S. Highway 9 is also an important route because it connects to a number of the towns bordering Barnegat Bay. The western portion of the County is handled in the North-South direction by County Route 539, which terminates in Tuckerton. State Highway 35 provides North-South access along the barrier beach from Seaside Heights to Point Pleasant Beach. Long Beach Island is serviced by municipal roads which run the length of the Island.

The present system of roadways provides adequate access to the more densely populated eastern half of Ocean County, as well as the less-dense western half of the County. A number of routes throughout the County are available for travel in the East-West direction. The northern half of the County is effectively handled by County Routes 528 and 571 and State Highways 37, 70, and 88. Below Toms River this traffic flow is on County Routes 74, 530, 532, and 534, and State Highway 72.

Traffic flow in both the North-South and East-West directions encounter similar situations with respect to locally reduced speed limits, increased traffic flow in urban areas, and peak traffic patterns. Less affected is the Garden State Parkway, which only experiences occasional peak traffic periods. Travel time in the eastern portion of the County is somewhat slower than in the western portion due to the increased population and traffic volumes.

Even though Ocean County has a well-developed system of highways, a special problem does develop due to its location along the coast and its tourist traffic. With the approach of warm weather, traffic flow increases until it reaches its peak during the months of July and August. Although weekends are the most critical times, weekday traffic is increased by the addition of summer residents and tourists.

Due to the generally rural nature of Ocean County, major peak congestion periods in the morning and evening are limited. Large numbers of vehicles do not pass through the County during rush hours, as is the case in the counties located closer to the New York City and Philadelphia metropolitan areas. Any residents which do travel North or West must leave early and return later than those employed in or near the County. This condition helps to further limit the congestion problem. The off peak periods within the County are most important to the transport of solid wastes. The typical solid waste collection route starts at 6 A.M., with the first haul to the disposal site at approximately 9 A.M., just following the morning rush period. After completion of the first haul, the collection trucks are usually ready to start the second collection around 10 to 11 A.M., and are prepared to haul again, around 1 to 2 P.M., prior to the evening rush period.

Future transportation plans call for the completion of Interstate Route 195 and the proposed construction of the Alfred E. Driscoll Expressway. In the northern and western portions of the County, Route 195 will open up Jackson, Lakewood, and Plumsted Townships to development. The Alfred E. Driscoll Expressway will provide a second route North for easy access to the metropolitan area. Another plan calls for the dualization of Routes 9, 70, and 72. All of these additions and modifications would provide better truck routes and reduce traffic congestion during the peak flow periods.

Rail access within Ocean County is limited to three lines, with only one carrying passengers. Passenger service is provided on the New York and Long Branch Railroad at Point Pleasant and Bay Head and the Central Railroad of New Jersey between Toms River and Manchester. Freight service is available on the New York and Long Branch Railroad, the Central Railroad to Lakewood and on Penn Central tracks leased to Union Transportation to New Egypt in the western part of the County.

There are several airports in Ocean County. The largest airport is the Lakehurst Naval Air Station facility in Manchester, Jackson and Plumsted Townships. However, this facility is limited to military aircraft only. In the northern section of the County, the Lakewood Airport and the Robert J. Miller Airpark in Berkeley Township serve private and industrial air traffic. In the southern areas, the Manahawkin Airport in Stafford Township and the Eagles Nest Airport in Eagleswood Township serve light plane traffic.

## III. TYPES OF SOLID WASTES PRODUCED IN OCEAN COUNTY

### GENERAL NATURE OF SOLID WASTES

"Solid Waste" is a general term used to describe many types of wastes including: garbage, trash, rubbish, clean-up wastes, yard debris, municipal debris, sewage treatment plant sludges, road sweepings, abandoned automobiles, and commercial, industrial, institutional and agricultural wastes. Generally, liquids, such as chemicals, and semi-liquids, from industrial operations are excluded from classification as solid wastes.

Mositure enters the solid wastes from sources such as rain-soaked leaves and wet garbage. Generally, the moisture content of solid waste is 10% to 30% water by weight. Table III-1 lists the general types of solid wastes produced.

The composition of solid wastes varies according to the time of year, day of week, etc. In the spring months a large increase in lawn, leaf, and gardening wastes develops. Many municipalities conduct clean-up programs in the spring and early summer. Refrigerators, washing machines, and other bulky items are discarded during these times. Nationally, figures show that average weekly tonnages may be exceeded by over 30% for peak periods.

In Ocean County, the solid waste tonnages in the summer months increase dramatically. Officials in several municipalities

## TABLE III-1

## GENERAL TYPES OF SOLID WASTES PRODUCED IN NEW JERSEY MUNICIPALITIES

| TYPE | COMPOSITION |
|---|---|
| ABANDONED VEHICLES | Junked cars and trucks left on public property |
| AGRICULTURAL WASTE SOURCES | Animal manures, vineyard and orchard prunings, greenhouse wastes, pesticides and containers, crop residue, etc. |
| ASHES | Residue from fuel and combustion of solid wastes |
| BULKY WASTES | Furniture, bedding, refrigerators, ranges, rubber tires, hot water heaters, boilers, etc. |
| CONSTRUCTION AND DEMOLITION WASTES | Lumber, masonry, pipes, asphaltic materials, concrete, construction materials from razed projects, and scrap building materials |
| DEAD ANIMALS | Cats, dogs, horses, cows, deer, wild animals, marine animals, etc. |
| GARBAGE | Wastes from preparation, cooking, serving, marketing, handling and storage of food |
| INDUSTRIAL WASTES | Variety of organic and inorganic chemicals, inert and decomposable materials and scrap |
| RUBBISH | Paper, boxes, cartons, wood, metals, tin cans, glass, minerals, ceramics, plastics, etc. |
| SEWAGE TREATMENT RESIDUE | Sludge, grit, coarse and fine screenings, precipitated solids |
| SLAG, FLY ASH AND INCINERATOR RESIDUE | Cinders, metal slag, charcoal, frit, etc. |
| SLUDGES | Semi-liquid or dewatered residue from industrial process operations or waste-water treatment operations |

TABLE III-1, CONTINUED

GENERAL TYPES OF SOLID WASTES
PRODUCED IN NEW JERSEY MUNICIPALITIES

| TYPE | COMPOSITION |
|---|---|
| SPECIAL WASTES | Pathologic wastes, hazardous or flammable solids, radioactive wastes |
| STREET REFUSE | Sweepings, catch basin dirt, contents of waste receptacles, street leaves |
| TRASH | Leaves, trees, branches, grass yard trimmings |

reported a ten-fold increase in population and two municipalities reported a twenty-fold summer population increase. Naturally, as the population base increases, the solid waste quantities increase proportionally.

## RESIDENTIAL SOLID WASTES

Residential solid wastes include wastes generated within the household, including paper, rubbish, and garbage, and wastes from the yard, including leaves, grass, hedge trimmings and branches, etc. The quantities and compositions of residential wastes will, of course, vary with the time of year and frequently with the day of week. For example, a Monday or Tuesday pickup generally has more food wastes and garbage and paper. Solid wastes quantities also vary on a yearly basis. Spring and summer months show an increase in gardening and yard wastes, and large or bulky clean-up materials.

National advertising and marketing trends have increased solid waste quantities. The introduction of the one-way bottle for soft drinks and other liquids has increased the quantities of glass in solid waste. In addition, throw-away paper towels, disposable diapers, plastic food containers, and unnecessarily over-packaged goods add to solid waste quantities.

The trend towards gas, oil, and electricity for home heating has reduced the coal and wood ash once common in solid waste.

In New York State, for example, from 1940 to 1960, the percentage of dwellings utilizing solid fuels dropped from 74.6% to 9.9%. In New Jersey, the percentage of dwellings using coal or other solid fuels is probably less than 5%.

Generally, the composition and analysis of solid wastes generated in New Jersey compare with the numerous published figures from the Federal Environmental Protection Agency. Table III-2 illustrates typical residential components of solid waste in Ocean County. Table III-3 illustrates ranges of components of solid waste found in several U. S. cities.

The densities of residential solid wastes in Ocean County vary with the type of solid waste, the level of compaction, and the moisture content, etc. A detailed analysis of component densities for residential, non-residential, commercial, and industrial solid wastes is presented at the end of this chapter.

NON-RESIDENTIAL MUNICIPAL WASTE

Non-residential municipal solid wastes typically include street sweepings, leaves, demolition waste, broken pavements and sidewalks, tree branches and trunks, and sewage sludges, etc. The composition and quantities of these wastes depend on the size of the municipality and the location. For example, officials in Brick Township indicate they dispose of 8 tons of seaweed per week during the summer, and Berkeley Township indicated

TABLE III-2

ESTIMATED ANALYSIS OF RESIDENTIAL SOLID WASTE COLLECTION COMPONENTS FOR OCEAN COUNTY

| COMPONENT | | TYPICAL PERCENTAGES Rural Sections of the County | TYPICAL PERCENTAGES Urban Areas of the County |
|---|---|---|---|
| DIRT | | 2% | 2% |
| GARBAGE: | Food Wastes, Fats, Meat Scraps, Rinds and Seeds, Vegetable Wastes | 20% | 12% |
| GLASS: | Bottles, Ceramics | 14% | 10% |
| METALS | | 10% | 11% |
| PAPER: | Corrugated, Mail, Newspapers, Kraft, Magazines, Cartons, Tissues | 40% | 42% |
| PLASTICS | | 4% | 4% |
| TEXTILES | | 1% | 2% |
| WOOD | | 2% | 1% |
| YARD WASTES: | Leaves, Grass, Branches Garden Plants | 2% | 13% |
| MISCELLANEOUS | | 5% | 3% |
| | TOTAL | 100% | 100% |

SOURCE: Studies by M. Disko Associates in Hunterdon, Monmouth, Passaic, Union, and Ocean Counties, including sampling programs to categorize and weigh household wastes.
Percentages should be considered as typical, but may vary in a particular municipality.

TABLE III-3

RANGE IN COMPOSITION OF DOMESTIC SOLID WASTES COLLECTIONS IN U. S. CITIES

| COMPONENT | PERCENT COMPOSITION BY WEIGHT | |
|---|---|---|
| | LOW | HIGH |
| GARBAGE | 0.8 | 36 |
| GLASS AND CERAMICS | 3.7 | 23 |
| METALS | 6.6 | 14.5 |
| PAPER | 13 | 62 |
| PLASTIC PRODUCTS | 1 | 20 |
| TEXTILES | 1.4 | 7.8 |
| WOOD | 0.4 | 7.5 |
| YARD WASTES | 0.3 | 33 |

SOURCE: Published data from Bureau of Solid Waste Management, Public Health Service.

that large quantities of sand are removed from the streets and roads.

COMMERCIAL SOLID WASTES

Commercial solid wastes are generated by a number of non-manufacturing businesses which include offices and laboratories, wholesale and retail stores, hospitals and institutions, markets, theaters, etc. The composition of the wastes vary depending on the nature of the businesses. Generally, commercial firms have large percentages of paper, corrugated cardboard, metal and wood. Food packing plants or restaurants have major food scrap percentages. Table III-4 illustrates some of the waste percentages found in the commercial sector based upon a survey by M. Disko Associates in Ocean County.

The methods and frequency of collection for commercial establishments depend on the size of the company and the quantities of the waste. Many small commercial stores utilize standard 20-gallon containers for their refuse. In many cases, the collection system utilized by the municipality for residential units also services these small stores.

Larger commercial firms, such as a multi-story office building, insurance companies, and department stores usually contract privately with a solid waste scavenger for their refuse removal. Most of these firms and businesses utilize open-top roll-off

## TABLE III-4

### TYPES OF INDUSTRIAL AND COMMERCIAL SOLID WASTES GENERATED IN OCEAN COUNTY

| COMPONENTS | PERCENT FROM INDUSTRIAL SOURCES | PERCENT FROM COMMERCIAL SOURCES |
|---|---|---|
| PAPER | 22.5 | 45.0 |
| PLASTIC | 1.8 | 6.8 |
| METAL | 7.9 | 3.9 |
| CERAMIC | 0.7 | 0.3 |
| ORGANIC CHEMICALS | 13.5 | 0.0 |
| INORGANIC CHEMICALS | 0.2 | 0.0 |
| GLASS | 0.7 | 1.7 |
| FOOD WASTES | 25.2 | 17.8 |
| TEXTILES | 0.7 | 0.2 |
| WOOD PRODUCTS | 21.8 | 5.3 |
| LEATHER | 0.3 | 0.0 |
| RUBBER | 0.4 | 2.4 |
| MIXED COMMERCIAL | 0.5 | 1.7 |
| PETROLEUM PRODUCTS | 0.4 | 0.5 |
| STONE, SAND, PLASTER | 3.2 | 1.0 |
| OTHER WASTES | 0.2 | 13.4 |
| TOTAL | 100.0 | 100.0 |

Detailed Questionnaires were sent to 187 industrial, and 164 commercial firms in Ocean County. Information in the above table is based on 107 fully-completed questionnaires.

containers which range in size from 3/4 cy to 10 cy. Generally, the disposal contractor will lease the container to the business. Many large commercial firms use a stationary compactor with a closed-top roll-off container (ranging in size from 20 to 45 cy.). Use of the stationary compactor provides volume reduction and subsequent savings in haulage costs. Commercial firms may be serviced from 2 to 6 times per week, depending on their needs. Many establishments that process food and have food scrap wastes are serviced on a daily basis.

## INDUSTRIAL SOLID WASTES

Industrial solid wastes include discarded by-products of production, residues, and wastes from utility companies, transportation systems, communication firms, manufacturing firms, etc. They include shipping, office, plant packaging and cafeteria wastes. Chemicals, sludges, and dissolved or suspended solids in wastewaters are generally classified as liquid industrial waste. However, many sludges are disposed of in a number of landfills throughout the State.

Industrial waste quantities are generally related to the number of employees and the type of manufacturing process. Questionnaires were prepared by M. Disko Associates and mailed to hundreds of manufacturing firms in Ocean County. The data obtained was used to estimate the types and quantities of solid waste produced by industrial firms. Table III-4 shows typical component percentages of industrial solid wastes.

Industrial collection practices vary according to the nature of the waste and the quantities generated. For example, toxic or dangerous chemicals require special handling and disposal. Scrap steel from a steel fabrication plant may be picked-up for salvage by a secondary materials dealer. Many industrial wastes can be handled in a sanitary landfill. Of course, hazardous, chemical, toxic, or liquid wastes will require other methods of disposal by firms specializing in handling these special wastes.

## PATHOLOGICAL WASTES

Hospitals, clinics, and institutions generate pathological wastes. Hospitals and institutions employ pathological incinerators to destroy waste materials which represent public health problems. Pathological incinerators typically operate at a temperature of from 1200°F to 1800°F in order to effectively prevent emission of pathogens in escaping gases. Hospital waste generation has taken a substantial increase in the last decade as a direct result of the wide-scale acceptance of disposable or single-use articles.

## ABANDONED AUTOMOBILES AND TRUCKS

Automobiles that are abandoned on the streets of Ocean County are handled by the municipalities in different ways. Most of the municipalities in Ocean County indicated they had programs to handle abandoned automobiles and trucks. Table III-5 summerizes the extent of programs in each municipality.

## TABLE III-5

## DESCRIPTION OF ABANDONED AUTOMOBILE DISPOSAL PROCEDURES USED IN OCEAN COUNTY

| MUNICIPALITY | DESCRIPTION OF PROCEDURE |
|---|---|
| BARNEGAT LIGHT | Municipality indicated no disposal problems. |
| BAY HEAD | Municipality indicated no disposal problems. |
| BEACH HAVEN | Approximately 6 automobiles per year are hauled to landfill for disposal - no cost to Beach Haven. |
| BEACHWOOD | Municipality indicated no disposal problems. |
| BERKELEY | Municipality indicated no disposal problems. |
| BRICK | Vehicles are sold to private contractor for scrap. |
| DOVER | Police and public arrange pick-up by a private hauler - no cost to Dover. |
| EAGLESWOOD | Junk dealer notified for pick-up - no cost to Eagleswood. |
| HARVEY CEDARS | Municipality indicated no disposal problems. |
| ISLAND HEIGHTS | Vehicles are removed by junk yard wrecker. |
| JACKSON | Residents notify Jackson D.P.W. for vehicle removal. |
| LACEY | Vehicles are kept in Township yard, then auctioned off. |
| LAKEHURST | Private contractor hauls vehicles away - no cost to Lakehurst. |
| LAKEWOOD | Police are contacted and vehicles are picked-up and placed in a car compound. |
| LAVALLETTE | Police arrange for disposal by private hauler. |

TABLE III-5, CONTINUED

DESCRIPTION OF ABANDONED AUTOMOBILE DISPOSAL PROCEDURES USED IN OCEAN COUNTY

| MUNICIPALITY | DESCRIPTION OF PROCEDURE |
|---|---|
| LITTLE EGG HARBOR | Municipality indicated no disposal problems. |
| LONG BEACH | Municipality indicated no disposal problems. |
| MANCHESTER | Agreement with local junk yard dealer and/or disposal by owner. |
| MANTOLOKING | Cars are picked-up and auctioned off. |
| OCEAN | Municipality indicated no disposal problems. |
| OCEAN GATE | Scrap metals dealer picks up vehicles when notified - no cost to Ocean Gate. |
| PINE BEACH | Municipality indicated no disposal problems. |
| PLUMSTED | Private haulers pick-up for scrap - no cost to Plumsted. |
| POINT PLEASANT | Police have vehicle towed to local junk yard. |
| POINT PLEASANT BEACH | Cars are towed to municipal garage, then auctioned. |
| SEASIDE HEIGHTS | Junk dealer notified for pick-up. |
| SEASIDE PARK | Police arrange disposal. |
| SHIP BOTTOM | Cars impounded and auctioned off. |
| SOUTH TOMS RIVER | Ordinance prohibits abandoning cars - if necessary, local junk dealer will pick-up. |
| STAFFORD | Individuals bring vehicles to landfill for disposal. |

TABLE III-5, CONTINUED

DESCRIPTION OF ABANDONED AUTOMOBILE DISPOSAL PROCEDURES USED IN OCEAN COUNTY

| MUNICIPALITY | DESCRIPTION OF PROCEDURE |
|---|---|
| SURF CITY | Municipality has ordinance requiring removal by owner. |
| TUCKERTON | Owner notified to remove - if not, municipality arranges pick-up and disposal. |
| UNION | Private hauler collects for scrap. |

## DENSITIES OF SOLID WASTES

The densities (weight per cubic yard) of solid wastes collected in Ocean County vary based upon several factors: 1) the type and nature of the wastes, and 2) the method of collection (packer-truck, roll-off container with compaction, etc.).

The densities of residential solid wastes are generally relatively consistent. Households, typically, use garbage cans or containers for storage of the wastes. However, during the spring or summer months or other times when a municipality has a clean-up, the densities increase as residents discard large or bulky items for disposal. Typically, domestic refuse weighs about 100 to 150 pounds per cubic yard at the collection point. When collected in compactor trucks, the densities increase as shown below:

| PACKER TRUCK VOLUME | TYPICAL RANGE OF COMPACTED DENSITIES |
|---|---|
| 12 to 18 cy | 400 to 550 lbs./cy |
| 20 cy | 500 to 650 lbs./cy |
| 25 cy | 550 to 800 lbs./cy |

Typical densities of residential solid wastes components are shown in Table III-6. Non-residential municipal-types wastes consist of abandoned automobiles, demolition wastes and municipal debris, etc. The average densities for the non-residential solid wastes are also shown in Table III-6.

## TABLE III-6

## AVERAGE DENSITIES OF SOLID WASTE COMPONENTS

| COMPONENT | SOURCE OF WASTE | DENSITY LBS/CU.YD. |
|---|---|---|
| APARTMENT INCINERATOR RESIDUE | Residential | 810 |
| ASHES AND CINDERS FROM SOLID FUELS | Residential | 1,220 |
| AUTOMOBILE BODIES | Municipal | 216 |
| AUTOMOTIVE PARTS | Commercial | 1,200 |
| BROKEN PAVEMENT OR SIDEWALK | Municipal | 2,560 |
| BRUSH | Residential | 54 |
| CEMENT WASTES | Industrial | 2,400 |
| CHEMICAL WASTES (DRY) | Industrial | 1,080 |
| CHEMICAL WASTES (WET) | Industrial | 1,620 |
| COMMERCIAL KITCHEN WASTES | Commercial | 167 |
| CONSTRUCTION, MIXED | Industrial | 1,620 |
| DEMOLITION, MASONRY | Municipal | 2,400 |
| DEMOLITION, WOOD | Municipal | 600 |
| DIRT, SAND, AND GRAVEL | Municipal | 2,430 |
| FOOD PROCESSING WASTES | Commercial | 540 |
| FURNITURE | Residential | 80 |
| GARBAGE AND KITCHEN WASTES | Residential | 167 |
| GLASS | Industrial | 700 |
| GLASS AND BOTTLES | Residential | 700 |
| GRASS AND GARDEN CLIPPINGS | Residential | 135 |
| HEAVY METAL SCRAP | Industrial | 4,050 |

## TABLE III-6, CONTINUED

## AVERAGE DENSITIES OF SOLID WASTE COMPONENTS

| COMPONENT | SOURCE OF WASTE | DENSITY LBS/CU.YD. |
|---|---|---|
| INCINERATOR RESIDUE | Industrial | 810 |
| INCINERATOR RESIDUE | Municipal | 810 |
| LIGHT METAL SCRAP | Industrial | 1,350 |
| LIMBS AND LEAVES (CHIPPED) | Municipal | 320 |
| LOGS AND STUMPS | Municipal | 675 |
| MAJOR APPLIANCES | Residential | 300 |
| MIXED COMMERCIAL | Commercial | 225 |
| MIXED TRASH AND STREET LITTER | Municipal | 140 |
| OIL, TARS, AND ASPHALTS | Industrial | 1,620 |
| PAPER AND CARDBOARD | Commercial | 120 |
| PAPER AND CARDBOARD | Residential | 120 |
| RUBBER MANUFACTURING WASTES | Industrial | 1,500 |
| SEWAGE GRIT | Municipal | 2,200 |
| SEWAGE SCREENINGS AND SKIMMINGS | Municipal | 1,600 |
| SEWAGE SLUDGE SOLIDS | Municipal | 1,750 |
| STREET SWEEPINGS | Municipal | 2,300 |
| TREE LIMBS AND LEAVES | Residential | 270 |
| WIRE | Industrial | 540 |
| WOOD PALLETS AND CRATES | Industrial | 300 |

The densities of commercial solid wastes vary depending on the type of business and the type of waste. A large department store might utilize a large roll-off container that attaches to a compactor for volume reduction. A supermarket will generally have more food and cardboard waste than an office building, which will discard mostly paper. The density of average mixed commercial solid wastes, at the point of collection, is about 200 to 250 lbs/cy. A roll-off container utilizing a stationary packer generally achieves densities in the range of 500 to 800 lbs/cy.

The densities of industrial solid wastes depend on the manufacturing process and the by-product or residue discarded. For example, a steel fabrication plant may dispose of scrap steel to a secondary materials dealer and the density of that waste would be high. Table III-6 illustrates the various densities for commercial and industrial waste components.

## IV. EXISTING SOLID WASTE MANAGEMENT SYSTEMS IN OCEAN COUNTY

### DESCRIPTION OF RESIDENTIAL COLLECTION SYSTEMS

The municipalities in Ocean County generally employ one of three types of residential solid waste collection systems. The municipal collection system utilizes municipal equipment and manpower for solid waste collection and disposal services. The monies for solid waste collection and disposal are allocated in the municipal solid waste budget. Under a municipal contract system, one or more private firms offering collection and disposal services contract with the municipality to provide residential solid waste collection and disposal services. The contractor(s) provides services to all residential units as specified in the contract agreement with the municipality which makes payments directly from general revenues.

On the private contracted collection system, the homeowner contracts directly with one of the many private firms who service Ocean County. The contractor usually bills the resident directly, either monthly or quarterly, for the services rendered. The costs of this service will vary depending on the level of service desired by the homeowner and the waste quantities produced.

There are, however, variations to the above mentioned methods that a municipality may use. For example, a municipality may have a municipal contractor service the residential units, but choose to operate its own vehicles and manpower for a clean-up week. Most municipalities that provide municipal collection or municipal contract collection require industrial, commercial, and multi-dwelling units to hire private contractors for solid waste collection and disposal services.

Table IV-1 defines several terms used to describe collection and disposal systems. Figure IV-1 illustrates the residential collection systems utilized in Ocean County. Twenty-two municipalities, comprising about 74 per cent of the County's population operate municipal collection systems. Eight municipalities, with about 11 per cent of the County's population, utilize a municipal contract collection system. The remaining three municipalities, with about 15 per cent of the County's population use private contracted collection services. Table IV-2 gives a summary of the residential solid waste collection systems employed by the thirty-three Ocean County municipalities.

A detailed description of each municipality's collection and disposal system, including costs, clean-up operations, disposal sites, etc., is included herein. Information on each municipality was verified with officials in each respective municipality. Table IV-3 and IV-4 give population statistics in the County.

BOROUGH OF BARNEGAT LIGHT

The Borough of Barnegat Light contracts with Caldeira Brothers of Toms River for the collection and disposal of residential and commercial solid wastes. The contract, which expires December 31, 1975, provides the 807 residential units and 5 apartments with 2 collections per week. The 39 commercial

TABLE IV-1

TYPES OF SOLID WASTE COLLECTION AND DISPOSAL PERMITTED UNDER EXISTING STATE STATUTES

| TYPE OF SYSTEM | CHARACTERISTICS |
|---|---|
| MUNICIPAL COLLECTION | The municipality provides solid waste collection services, utilizing its own manpower and equipment, Costs are paid out of municipal tax revenues. |
| MUNICIPAL CONTRACT COLLECTION | The municipality contracts with a private solid waste collector for the provision of solid waste collection services. The contract is funded by the municipality. |
| PRIVATE CONTRACTED COLLECTION SERVICE | Individual residents or firms hire a private solid waste contractor to provide them with collection services. Under this system, the municipality's involvement in solid waste management is generally limited to enforcing health and sanitary codes. |
| INDIVIDUAL COLLECTION | Individual residents or firms haul their own solid wastes to appropriate disposal areas. This method is still employed somewhat in rural areas of the State by homeowners, and by many commercial and industrial firms. |
| MUNICIPAL DISPOSAL | The municipality operates its own landfill (or incinerator) disposal facility. The facility may service any combination of the collection systems identified above. |
| PRIVATE DISPOSAL | A private individual or firm owns and operates the disposal facility which may service any combination of the collection systems identified above. |
| INDIVIDUAL DISPOSAL | Individual residents may employ their own landfill. In rural areas, for example, individuals may compost the organic fraction of their wastes and bury the non-organic fraction. Many large industrial firms operate their own disposal facilities. |

# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

## RESIDENTIAL SOLID WASTE COLLECTION SYSTEMS

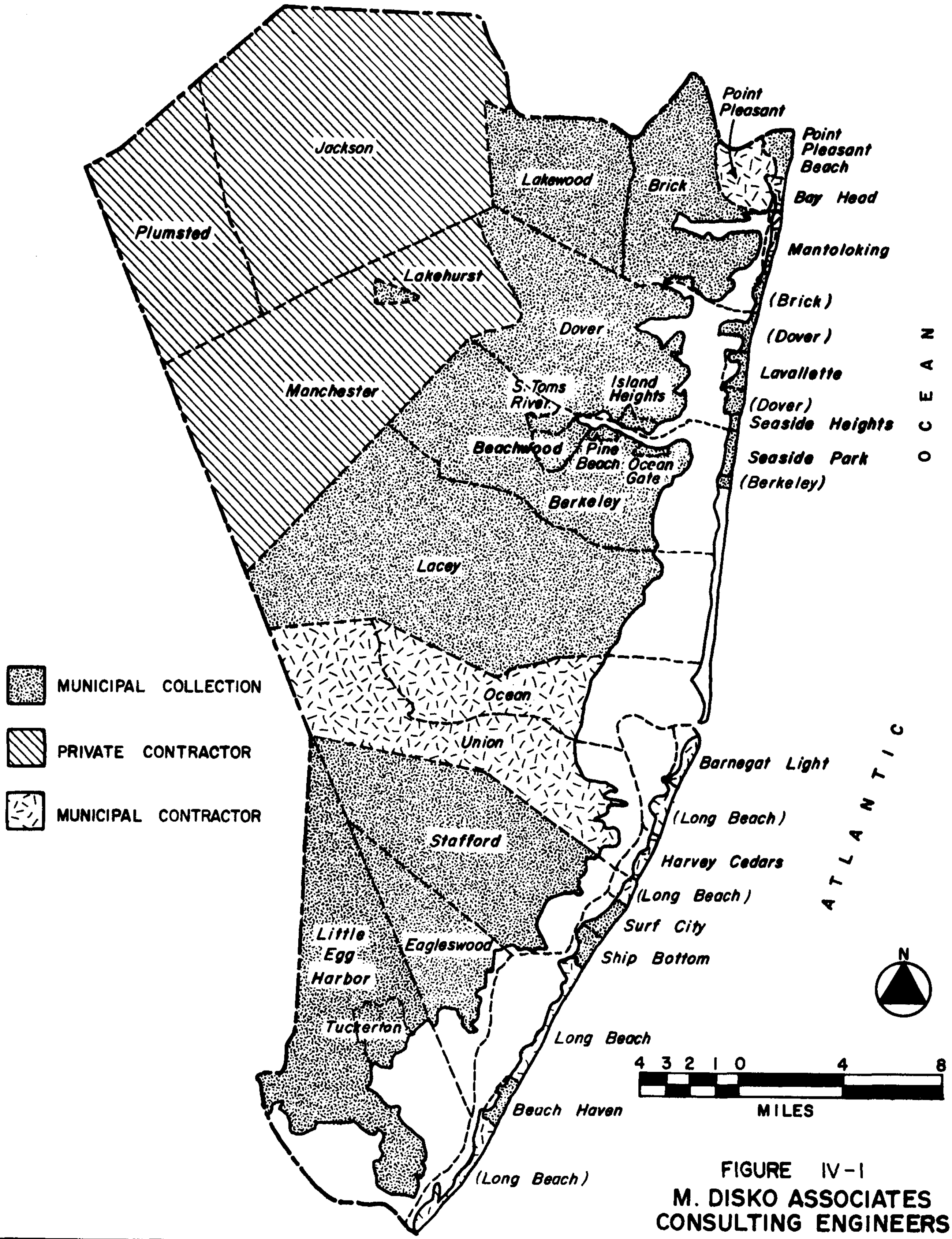



FIGURE IV-1

M. DISKO ASSOCIATES
CONSULTING ENGINEERS

TABLE IV -2

OCEAN COUNTY SOLID WASTE STUDY

RESIDENTIAL SOLID WASTE COLLECTION SYSTEMS IN OCEAN COUNTY

| MUNICIPALITY | LOCATION OF RECEPTACLES | NUMBER OF COLLECTIONS PER WEEK | TYPE OF COLLECTION SYSTEM | NUMBER OF SOLID WASTE CONTRACTORS |
|---|---|---|---|---|
| BARNEGAT LIGHT | Curb | 2 | Contract | 1 |
| BAY HEAD | Backyard | 3 | Contract | 1 |
| BEACH HAVEN | Backyard | 3 | Municipal | M |
| BEACHWOOD | Curb | 2 | Municipal | M |
| BERKELEY | Curb | 2 | Municipal | M |
| BRICK | Curb | 2 | Municipal | M |
| DOVER | Curb | 2 | Municipal | M |
| EAGLESWOOD | Curb | 2 | Municipal | M |
| HARVEY CEDARS | Curb | 2 | Contract | 1 |
| ISLAND HEIGHTS | Curb | 3 July-Aug.<br>2 Balance | Municipal | M |
| JACKSON | Curb | 2 | Private | 2 |
| LACEY | Curb | 2 | Municipal | M |
| LAKEHURST | Curb | 2 | Municipal | M |
| LAKEWOOD | Curb | 2 | Municipal | M |
| LAVALLETTE | Curb | 3 summer<br>2 winter | Municipal | M |
| LITTLE EGG HARBOR | Curb | 2 | Municipal | M |
| LONG BEACH | Curb | 2 | Contract | 1 |
| MANCHESTER | Curb | 2 | Private | 4 |
| MANTOLOKING | Backyard | 3 summer<br>2 winter | Contract | 1 |
| OCEAN | Curb | 2 | Contract | 1 |

TABLE IV-2, CONTINUED

OCEAN COUNTY SOLID WASTE STUDY

RESIDENTIAL SOLID WASTE COLLECTION SYSTEMS IN OCEAN COUNTY

| MUNICIPALITY | LOCATION OF RECEPTACLES | NUMBER OF COLLECTIONS PER WEEK | TYPE OF COLLECTION SYSTEM | NUMBER OF SOLID WASTE CONTRACTORS |
|---|---|---|---|---|
| OCEAN GATE | Curb | 3 summer<br>2 winter | Municipal | M |
| PINE BEACH | Curb | 2 | Municipal | M |
| PLUMSTED | Curb | 1 | Private | 1 |
| POINT PLEASANT | Curb | 3 summer<br>2 winter | Contract | 1 |
| POINT PLEASANT BEACH | Curb | 3 summer<br>2 winter | Municipal | M |
| SEASIDE HEIGHTS | Curb | 7 summer<br>3 winter | Municipal | M |
| SEASIDE PARK | Backyard | 3 June-Sept.<br>2 Balance | Municipal | M |
| SHIP BOTTOM | Curb | 3 summer<br>2 winter | Municipal | M |
| SOUTH TOMS RIVER | Curb | 2 | Municipal | M |
| STAFFORD | Curb | 2 | Municipal | M |
| SURF CITY | Curb | 2 | Municipal | M |
| TUCKERTON | Curb | 2 | Municipal | M |
| UNION | Curb | 2 | Contract | 1 |

TABLE IV-3

1974 OCEAN COUNTY POPULATION AND HOUSING STATISTICS

| MUNICIPALITY | 1974 POPULATION* | LAND AREA SQ. MI. | POPULATION DENSITY PER SQUARE MILE* | TOTAL HOUSING UNITS** | HOUSING UNITS PER SQUARE MILE | AVERAGE NUMBER OF PERSONS PER HOUSING UNIT* |
|---|---|---|---|---|---|---|
| BARNEGAT LIGHT | 620 | 0.62 | 1000.0 | 812 | 1310 | 0.76 |
| BAY HEAD | 1090 | 0.65 | 1676.9 | 825 | 1269 | 1.32 |
| BEACH HAVEN | 1640 | 1.00 | 1640.0 | 2000 | 2000 | 0.82 |
| BEACHWOOD | 5170 | 2.80 | 1846.4 | 2000 | 714 | 2.58 |
| BERKELEY | 12,270 | 37.56 | 326.7 | 6145 | 164 | 2.00 |
| BRICK | 44,795 | 26.40 | 1696.8 | 15,790 | 598 | 2.84 |
| DOVER | 50,185 | 44.03 | 1139.8 | 40,000 | 908 | 1.25 |
| EAGLESWOOD | 860 | 17.10 | 50.3 | 400 | 23 | 2.15 |
| HARVEY CEDARS | 500 | 0.79 | 632.9 | 834 | 1056 | 0.60 |
| ISLAND HEIGHTS | 1440 | 0.63 | 2285.7 | 650 | 1032 | 2.22 |
| JACKSON | 21,000 | 100.89 | 208.1 | 5386 | 53 | 3.90 |
| LACEY | 7560 | 86.47 | 87.4 | 5630 | 65 | 1.34 |
| LAKEHURST | 2930 | 1.16 | 2525.9 | 925 | 797 | 3.17 |
| LAKEWOOD | 32,550 | 25.80 | 1261.6 | 10,145 | 393 | 3.21 |
| LAVALLETTE | 1545 | 0.57 | 2710.5 | 2018 | 3540 | 0.77 |
| LITTLE EGG HARBOR | 4675 | 48.20 | 97.0 | 4178 | 87 | 1.12 |
| LONG BEACH | 3645 | 4.20 | 867.9 | 5711 | 1360 | 0.64 |
| MANCHESTER | 12,835 | 82.30 | 156.0 | 7035 | 85 | 1.82 |
| MANTOLOKING | 315 | 0.49 | 642.9 | 456 | 931 | 0.69 |
| OCEAN | 2680 | 19.97 | 134.2 | 2250 | 113 | 1.19 |

*Does not include summer population.

**Includes farms. Based on information furnished by Municipality.

TABLE IV-3, CONTINUED

1974 OCEAN COUNTY POPULATION AND HOUSING STATISTICS

| MUNICIPALITY | 1974 POPULATION* | LAND AREA SQ. MI. | POPULATION DENSITY PER SQUARE MILE* | TOTAL HOUSING UNITS** | HOUSING UNITS PER SQUARE MILE | AVERAGE NUMBER OF PERSONS PER HOUSING UNIT* |
|---|---|---|---|---|---|---|
| OCEAN GATE | 1115 | 0.50 | 2230.0 | 1000 | 2000 | 1.12 |
| PINE BEACH | 1480 | 0.75 | 1973.3 | 761 | 1015 | 1.94 |
| PLUMSTED | 4525 | 40.70 | 111.2 | 1022 | 25 | 4.43 |
| POINT PLEASANT | 16,760 | 3.60 | 4655.6 | 6041 | 1678 | 2.77 |
| POINT PLEASANT BEACH | 4945 | 1.50 | 3296.7 | 3500 | 2333 | 1.41 |
| SEASIDE HEIGHTS | 1400 | 0.25 | 5600.0 | 2500 | 10,000 | 0.56 |
| SEASIDE PARK | 1505 | 0.60 | 2508.3 | 1600 | 2667 | 0.94 |
| SHIP BOTTOM | 1195 | 0.71 | 1683.1 | 1386 | 1952 | 0.86 |
| SOUTH TOMS RIVER | 4240 | 1.40 | 3028.6 | 1061 | 758 | 4.00 |
| STAFFORD | 4595 | 45.90 | 100.1 | 3768 | 82 | 1.22 |
| SURF CITY | 1275 | 0.90 | 1416.7 | 1800 | 2000 | 0.71 |
| TUCKERTON | 2265 | 3.80 | 596.1 | 1275 | 336 | 1.78 |
| UNION | 4180 | 38.60 | 108.3 | 1544 | 40 | 2.71 |
| OCEAN COUNTY | 257,785 | 640.7 | 402.3 | 140,448 | 219 | 1.84 |

*Does not include summer population.

**Includes farms. Based on information furnished by Municipality.

## TABLE IV-4

## OCEAN COUNTY POPULATION, 1974

| MUNICIPALITY | ALL-YEAR POPULATION | ESTIMATED SUMMER POPULATION | WEIGHTED EQUIVALENT* POPULATION |
|---|---|---|---|
| BARNEGAT LIGHT | 620 | 9,000 | 2,232 |
| BAY HEAD | 1,090 | 6,000 | 2,034 |
| BEACH HAVEN | 1,640 | 30,000 | 7,094 |
| BEACHWOOD | 5,170 | 6,400 | 5,407 |
| BERKELEY | 12,270 | 14,000 | 12,603 |
| BRICK | 44,795 | 80,000 | 51,565 |
| DOVER | 50,185 | 60,700 | 52,207 |
| EAGLESWOOD | 860 | 1,000 | 887 |
| HARVEY CEDARS | 500 | 7,000 | 1,750 |
| ISLAND HEIGHTS | 1,440 | 2,900 | 1,721 |
| JACKSON | 21,000 | 28,000 | 22,346 |
| LACEY | 7,560 | 30,000 | 11,875 |
| LAKEHURST | 2,930 | 2,930 | 2,930 |
| LAKEWOOD | 32,550 | 32,550 | 32,550 |
| LAVALLETTE | 1,545 | 22,000 | 5,479 |
| LITTLE EGG HARBOR | 4,675 | 18,500 | 7,334 |
| LONG BEACH | 3,645 | 45,000 | 11,598 |
| MANCHESTER | 12,835 | 19,000 | 14,021 |
| MANTOLOKING | 315 | 2,000 | 639 |
| OCEAN | 2,680 | 6,000 | 3,318 |
| OCEAN GATE | 1,115 | 2,500 | 1,381 |
| PINE BEACH | 1,480 | 2,500 | 1,676 |
| PLUMSTED | 4,525 | 4,525 | 4,525 |
| POINT PLEASANT | 16,760 | 25,000 | 18,345 |
| PT. PLEASANT BEACH | 4,945 | 35,000 | 10,725 |
| SEASIDE HEIGHTS | 1,400 | 35,900 | 8,035 |
| SEASIDE PARK | 1,505 | 30,000 | 6,985 |
| SHIP BOTTOM | 1,195 | 16,000 | 4,042 |
| SOUTH TOMS RIVER | 4,240 | 5,000 | 4,386 |
| STAFFORD | 4,595 | 11,000 | 5,827 |
| SURF CITY | 1,275 | 12,000 | 3,338 |
| TUCKERTON | 2,265 | 5,400 | 2,868 |
| UNION | 4,180 | 8,100 | 4,934 |
| COUNTY | 257,785 | 615,905 | 326,654 |

*Based on 10-week estimated summer population.

establishments are serviced three times per week. All units are serviced at the curb. The cost for this service is $26,631 yearly for collection, and $4,200 for disposal.

In addition, the Borough provides year-round clean-up, when residents may place large or bulky refuse at the curb for collection. The clean-up is conducted with municipal manpower and equipment. The costs of the clean-up are reportedly $1,500 for the period. The Borough also maintains a roll-off container which residents are allowed to bring bulky refuse and trash to for disposal. In addition, municipal debris and beach clean-up are put into the roll-off container. The container is serviced weekly during the summer by the municipal contractor, Caldeira Brothers, for a reported cost of $90 per filled container. Road sweeping is done on a periodic basis by the County. When needed, a commercial sweeper is hired. The rates paid to the sweeper are $15 per hour.

Currently, all solid wastes generated in Barnegat Light are hauled to the Caldeira Brothers landfill, Southern Ocean Landfill, Inc., in Waretown, for disposal. The disposal site is some 50 round-trip miles from the Borough.

BOROUGH OF BAY HEAD

The Borough of Bay Head is presently under contract with the collection firm of James Whaley of Point Pleasant for the collection of residential and commercial solid wastes. Reportedly, 800 single-family and 25 multi-family residential units are provided backyard pickup of solid wastes three times a week. The contractor covers two collection routes on a Monday-Wednesday-Friday, and Tuesday-Thursday-Saturday collection schedule. Reportedly, 43 commercial establishments in Bay Head are provided daily (except Sunday) collection by the municipal contractor. The contract runs from January 1, 1974 to December 31, 1976 and has an annual cost of $62,666.66. In addition, the contractor collects leaves and grass clippings on Wednesdays and Thursdays. The material must be in a plastic bag and placed at the curb. The cost for this service is included in the contract price.

When street sweeping is required, the municipality hires a commercial driver and sweeper. The cost for this service is reportedly $22 per hour.

The contractor provides two clean-up days in May, in June, and in October when residents may place large or bulky items at the curb for collection. The costs are included in the contract price.

The contractor presently hauls the solid wastes to the Lakewood Township Municipal Landfill, located on Farraday Avenue, in Lakewood Township, some 25 round-trip miles away.

## BOROUGH OF BEACH HAVEN

The Borough of Beach Haven has a municipal collection system, utilizing municipal manpower and equipment to provide solid waste collection and disposal services to the residential and commercial units in the Borough. The 2000 residential units are provided 3 backyard pick-ups per week. Approximately 72 commercial establishments are provided 7 collections per week in the summer and 6 collections per week during the winter.

The Borough also collects clean-up items every Thursday, but sets aside the first two weeks in June as an official "clean-up" period. The Borough has no special provisions for leaf collection, and the County does the street sweeping. There are approximately 6 abandoned automobiles per year that are hauled to the landfill at no cost to the Borough.

The 1975 annual municipal solid waste budget included $59,950. for salaries and wages, $16,000. for vehicle maintenance and depreciation, and $12,000. for disposal. The reported total annual cost is $87,950.

Currently, all solid wastes generated in the Borough are hauled to Southern Ocean Landfill, Inc., in Waretown for disposal. The landfill is about 48 round-trip miles from the Borough.

## BOROUGH OF BEACHWOOD

The Borough of Beachwood provides municipal collection of residential and commercial solid wastes. Reportedly, 2000 residential and 35 commercial units are provided twice-weekly curbside pickup. The collection schedule is Monday-Thursday and Tuesday-Friday. In addition, some 30 commercial units are serviced by a private contractor. The costs for the collection and disposal services, as listed in the municipal budget, are $72,519. for collection and $20,535. for disposal for a total cost of $93,054. per year.

The Borough also provides once-a-month clean-up from September through April, four times a month during May and June, and twice a month during July and August. The clean-up services reportedly cost the Borough $2,500. per year. There are no provisions for leaf or grass collection, road sweeping collection, and the municipality reportedly has no abandoned vehicle problem.

The Borough currently operates its own municipal landfill within the Borough. Residents wishing to use the landfill must first secure a permit from the Borough Clerk. The permit is valid from January 1 to December 31 of each year. Vehicles with a rated capacity exceeding one ton must obtain a special permit.

## TOWNSHIP OF BERKELEY

Berkeley Township has its own municipal collection system for the residential and institutional solid wastes generated in the Township. The commercial and industrial firms must contract with either Caldeira Brothers of Toms River or Karchik and Son Disposal Service for their refuse removal. The costs for these services vary on the quantities of solid waste collected and the level of service desired.

The municipality provides the 6145 residential units and 10 institutional units with twice-weekly curbside collection. Large or bulky items are collected at the curb every collection day. The costs for these services as allocated in the municipal solid waste budget are $110,000 for collection, and $22,830 for disposal with a total cost of $132,830 per year.

Currently, the Township hauls all solid wastes to its own municipally-operated landfill in the Township. The Township also cleans the streets and utilizes the debris, which is mostly sand, as an inert fill.

Current plans for the Township indicate that land reclaimed by their landfilling operation will be used for a municipal complex consisting of a new Township garage, new police pistol range, a conservation area, etc. The Township garage and pistol range have been constructed.

## TOWNSHIP OF BRICK

The Township of Brick utilizes a municipal collection system to service the municipality's 16,694 residential units. The residential areas are collected twice weekly at the curb by municipal manpower and equipment. The smaller commercial establishments in the Township are additionally serviced by the Township system, but the larger firms must contract with a private scavenger for their refuse removal or haul it themselves. In 1973, some 28 commercial firms had collection and disposal applications on file with the New Jersey Department of Environmental Protection

The costs as allocated in the municipal solid waste budget include , $645,122 for collection, $234,015 for disposal, and $17,140 for recycling.

In addition, the Township allocates $33,606 to remove and dispose of seaweed from lagoons and rivers. The Township utilizes three Vac-All units to collect leaves in the fall, which are hauled to the Township's landfill for disposal. The cost for these services is reportedly $32,246. The Township also operates two road sweepers that clean debris from the roads. All sweepings are disposed of in the

Township's landfill. The costs are included in the leaf disposal budget. The Township has recently begun separate curbside collection of paper and glass to encourage recycling. The budget provides $17,140 for this service.

The Township hauls the solid waste to one of two landfills located in Brick Township. The primary fill, formerly known as French's, but now called Brick Town Municipal Landfill, accepts all wastes, solid and liquid, generated in the Township. The other fill, known as Burges, accepts only trash, building rubble, and tree debris. The primary fill is open to the public but Burge's is restricted to Township use only.

TOWNSHIP OF DOVER

The Township of Dover utilizes a municipal collection system to provide the Township's 40,000 residential units and 600 commercial firms with twice-weekly curbside collection. In addition, some private contractors service some commercial units in the Township. The municipality collects large or bulky items on a call basis. The Township utilizes its own equipment to collect leaves in the fall and spring, and it utlizes four mobile sweepers to clean street debris. Abandoned automobiles are collected by a private scavenger.

Solid waste costs, as allocated in the municipal solid waste budget include $545,000. for collection and $45,000. for operation of the municipal landfill.

The Board of Education in Toms River utilizes its own collection truck to service the school system's solid waste. During the summer months, a trash truck is stationed on Ortley Beach and Ocean Beach to receive trash from visitors.

All solid wastes generated in Dover Township are hauled to the Township's own landfill on Church Road, located within short haul from all parts of the Township. There is no fee for contractors or residents using the landfill providing the wastes originated in Dover Township.

TOWNSHIP OF EAGLESWOOD

The Township of Eagleswood services its 400 residential units and 10 commercial establishments with a municipal collection system. All units receive twice-weekly curbside collection. The costs for these services are $15,000. annually. The Township provides two clean-up collections a year. Large, heavy or bulky items may be placed at the curb for collection during the clean-up collections. The Township has no provisions for leaf collection and the roads are cleaned by the County under contract.

Solid wastes generated in Eagleswood are hauled to the Tuckerton-Eagleswood landfill located in Eagleswood Township. The landfill is run jointly by the Departments of Sanitation of the two municipalities. The landfill is located on Forge Road and is within short haul of all parts of the Township.

## BOROUGH OF HARVEY CEDARS

Harvey Cedars employs a municipal contractor to service the 970 residential and commercial units in the Borough. The contract with Calderia Brothers of Toms River expires on December 31, 1975. The cost to the municipality is: $24,377. for collection and $3,800. for disposal for a total cost of $28,177. per year. In addition, the Borough collects large or bulky items during a two-week clean-up period, using municipal equipment and manpower at a cost of $1,200. annually. The contractor provides twice-weekly pick-up of residential wastes at the curb.

Caldeira Brothers hauls the waste to the Southern Ocean Landfill, Inc., in Waretown, some 36 round-trip miles away. Additionally, the Borough hauls the clean-up wastes to the Southern Ocean Landfill, Inc. The Borough also uses municipal labor and equipment to collect street debris which is utilized as an inert fill material. Abandoned automobiles are towed away at a reported cost of ten dollars per car.

## BOROUGH OF ISLAND HEIGHTS

The Borough of Island Heights has a municipal collection system where the 650 residential units, 12 commercial units, and one institution are provided curbside pick-up of their solid wastes. The municipality provides three pick-ups weekly during the summer peak months of July and August, and twice-weekly collection at other times.

The annual costs to the municipality for these services are $18,300. for collection and $5,626. for disposal. The Borough collects large or bulky clean-up items on a periodic basis. There are no provisions for leaf collection, and County sweepers clean street debris. The Borough currently hauls the solid wastes some 46 round-trip miles to the Southern Ocean Landfill, Inc., in Waretown, Ocean Township.

## TOWNSHIP OF JACKSON

The residential and commercial units in Jackson Township either contract with a private contractor for their solid waste removal or they haul the wastes themselves. The contractors, which include Tush Carting of Jackson and Waste Technology Enterprises of Lakewood, generally provide twice-weekly, curbside service to the residential and smaller commercial units. The larger commercial firms, such as department stores are serviced according to need. According to municipal officials, approximately 2,500 homeowners utilize the services of private contractors.

Additionally, the Township collects tree branches, leaves, and grass with municipal manpower and equipment. The Township also conducts an annual spring clean-up when residents may place large or bulky items at the curb for disposal. Abandoned automobiles are removed by calling the Department of Public Works.

Currently, all clean-up, municipal, leaf, grass, and street debris waste is hauled to the Jackson Municipal Landfill on Lakehurst Avenue, located within the Township. All homeowners also haul to the Jackson Landfill. In the period from January 1, 1974 to June 30, 1974, the landfill reportedly had 18,829 passenger cars and 4,047 pick-up trucks use the landfill. The 1973 municipal solid waste budget allocated $98,501. for operation of the landfill. That included $26,588 for salaries and wages and $71,913. for other expenses. The private contractors who service the industrial and commercial firms persently haul to the Lakewood Landfill located on Cross Street in Lakewood Township.

TOWNSHIP OF LACEY

Lacey Township provides municipal collection and disposal of residential solid wastes generated in the Township. The municipality provides twice-weekly curbside collection to the residential units. The commercial and industrial firms in the County must contract privately with a private solid waste contractor, one of which includes Caldeira Brothers of Toms River who reportedly services 150 commercial establishments and 10 industrial plants. There also are many commercial and industrial firms who haul their own solid wastes.

Additionally, the Township has a two-week clean-up in May when residents may place large or bulky items at the curb for collection. The Township utilizes municipal manpower and equipment for this service at an estimated cost of $5,000. annually. The municipal solid waste budget is $120,000. for collection, and $19,500. for disposal, for a total cost of $139,500. annually.

Municipal debris and road sweepings are utilized by the Township as cover material for their landfill. Abandoned vehicles are kept in the Township yard until such time as they can be auctioned off. There is no cost to the municipality for this service. Presently, all solid wastes generated in Lacey Township are hauled to the Township's own landfill located behind the Road Department Building on Lacey Road.

## BOROUGH OF LAKEHURST

The Borough of Lakehurst utilizes a municipal collection system to service the 925 residential units and 17 commercial stores in the municipality. The Borough provides twice-weekly curbside collection. Larger commercial firms must contract separately with a private scavenger for their waste removal.

The 1974 annual municipal solid waste budget included $27,000. for the collection and disposal of solid wastes. In addition, the month of May is set aside as a clean-up period. The costs of the clean-up operation are included in the budget. The Borough and County both clean the streets, and abandoned vehicles are hauled away at no cost to the Borough.

Presently, the solid wastes are hauled to the Borough's own landfill, located on Myrtle Avenue. The 15-acre facility is within easy haul of all parts of the Borough.

## TOWNSHIP OF LAKEWOOD

The Township of Lakewood operates a municipal collection system to service the residential and commercial firms in the municipality. Industrial and institutional firms must contract privately with one of four private contractors operating in the Township, including: Waste Technology, Inc., of Lakewood, Wilenta Brothers of Lakewood, Tush Carting of Lakehurst, and L & J Carting of Jackson.

The reported number of collection units served in the municipality are:

| TYPE OF UNIT | NUMBER SERVED |
|---|---|
| Residential: | |
| Single-Family | 9,957 |
| Multi-Family | 99 |
| Commercial | 353 |
| Industrial | 44 |
| Other - Farms | 89 |
| Total | 10,542 |

The Township provides twice-weekly curbside service. The private contractors arrange individual schedules to meet the needs of the industrial and commercial customers.

The municipal solid waste budget includes $24,800. for collection and $38,800. for disposal. In addition, the Township utilizes a truck and three-man crew to collect trash and litter daily. The truck also collects large or bulky items placed at the curb for disposal. Reportedly, this service costs the municipality $15,000. annually. The Township also spends $10,000. annually for a leaf collection system. The Township is divided into sections and each section is serviced on a regular basis. Road sweepings and municipal debris are collected by the municipal workforce and hauled to the Township Landfill for disposal. The annual cost for this service is reportedly $20,000. Abandoned automobiles are placed in a car compound.

The costs incurred by the commercial and industrial firms vary depending on the degree of service and the frequency of collection. However, for twice-weekly curbside collection, one contractor reportedly charges $3.00 per cubic yard and another $3.50 to $4.00 per month. At the present time, the Township is recycling paper, glass, and metal at the municipal garage.

## BOROUGH OF LAVALLETTE

The Borough of Lavallette has a municipal collection system to service its 2,018 residential units and 94 commercial units. The municipality provides curbside collection 3 times a week during the summer months to residences and 6 times a week to commercial stores. However, both residential and commercial units receive only twice-a-week service the remainder of the year.

The annual municipal solid waste budget includes $72,500. for collection and disposal. The Borough also conducts a clean-up operation one day per month, except for July, August, and September. There are no special provisions made for leaf collection, street sweepings, and the police arrange for abandoned automobile disposal.

The Borough is presently hauling its waste to the Ocean County Landfill Corp., in Manchester Township, some 29 round-trip miles away. They use three 25 cubic yard packers and one 20 cubic yard packer. The fees charged by the Ocean County Landfill Corp. are reportedly $0.95 per cubic yard for solid waste hauled to the facility by the Borough and $0.01 per gallon for wastes from the Borough's sewage treatment plant.

## TOWNSHIP OF LITTLE EGG HARBOR

The Township of Little Egg Harbor utilizes municipal manpower and equipment to service the 4,178 residential units and 72 commercial establishments in the Township. The municipality provides twice-weekly curbside collection to both the residential and commercial units. In addition, the first Wednesday of each month is a clean-up day when residents are allowed to place large or heavy items at the curb for disposal.

The costs for the services are $30,000. for salaries and wages, and $97,000. for disposal, truck maintenance, depreciation, etc., for a total annual solid waste budget of $127,000.

The Township has no special provisions for leaf collection or abandoned vehicle disposal and the County sweeps the streets. Currently, all solid wastes generated in the Township are hauled to the municipal landfill on Forge Road. The disposal site is centrally located for easy haulage from all parts of the Township.

## TOWNSHIP OF LONG BEACH

The Township of Long Beach contracts with Caldeira Brothers, Inc. of Toms River, for solid waste collection and disposal. Caldeira Brothers collects and disposes of solid wastes from the municipality's 5,711 residential units and about 50 commercial units. Caldeira Brothers also collects from approximately 100 commercial units, who contract with him privately. The residential units are provided twice-weekly curbside pick-up and the commercial areas are serviced as needed.

The cost of the annual municipal solid waste budget is: $115,900. for collection and $33,000. for disposal, for a total of $148,900. In addition, the municipality provides a one week clean-up period during the spring when residents may place large or bulky items at the curb for disposal. The cost for this service is reportedly $1,000. There is no organized leaf collection in the Township, but the municipality spends $15,000. annually to dispose of sand from roads and streets.

Currently, all solid wastes generated in the Township and collected by Caldeira Brothers are hauled to the Stafford Township municipal landfill.

## TOWNSHIP OF MANCHESTER

The Township of Manchester utilizes the services of four private contractors for the collection and disposal of solid wastes generated within the Township. The contractors, including Tush Carting of Lakehurst; Waste Technology, Inc., of Lakehurst, contract privately with the residents for generally twice-weekly curbside pick-up. The commercial firms are serviced from twice to three times weekly and the institutions, three times weekly. The industrial firms are picked up as required.

The reported collection units are described below:

| TYPE OF UNIT | NUMBER SERVED |
|---|---|
| Residential, including Single and Multi-Family, Senior Citizen Villages, Mobile Home Parks | 7,400 |
| Commercial | 60 |
| Industrial | 12 |
| Institutional (Schools, Churches, etc.) | 5 |
| Other - Municipal buildings, Firehouses, First Aid, etc. | 6 |
| Total | 7,483 |

The costs for the services vary, of course, with the individual contractor and the level of service desired. One contractor who provides twice-weekly curbside collection, charges $3.25 to $3.50 per month for the services.

In addition, the Township provides a 1-1/2 month clean-up period in the spring and again in the fall. The residents are allowed to place large or bulky items at the curb and telephone the municipal building to arrange pickup. The cost for this service is approximately $3,000. for the three month period.

The private contractors utilize the Ocean County Landfill located on Route 70. The Manchester Township Landfill, also located on Route 70, is open for Township residents only. Residents may bring leaves to either landfill during regular hours or they may have it collected during the clean-up periods. Municipal debris and road sweepings are brought to either landfill by municipal vehicles.

BOROUGH OF MANTOLOKING

The Borough of Mantoloking has a two-year contract which expires December 31, 1975 with the Marpal Company of West Long Branch, Monmouth County. Under the terms of the contract, the private contractor provides backyard pickup 3 times per week during the summer and twice-weekly during the winter to the 456 residential units in the municipality. In addition, at no additional cost, large or bulky clean-up materials placed at the curb during the spring and summer are collected.

The costs to the municipality are $35,233. annually which includes collection, disposal, and clean-up. The contractor hauls the refuse to Shrewsbury Disposal, Inc., on Asbury Avenue, in Monmouth County. The contractor reportedly uses two 25 cubic yard rear-end loaders to service the Borough.

TOWNSHIP OF OCEAN

The Township of Ocean contracts with the private collection firm of Caldeira Brothers, for the collection and disposal of its solid waste. The contract, which runs to December 31, 1977. provides the 2,250 residential units and the 82 commercial units with curbside pickup twice weekly. The costs for these services are approximately $46,725. per year for the residential units' collection only.

In addition to the municipal contractor, the municipality hires two men at a cost of about $2,000. to conduct a once-a-year clean-up operation during the month of June. There are no provisions for leaf collection and the County cleans the Township's roads.

The contractor presently hauls the solid wastes to the Southern Ocean Landfill in Waretown, Ocean Township, where the Township has a 25-year free disposal agreement. The landfill is a short haul distance from all parts of the municipality.

BOROUGH OF OCEAN GATE

The Borough of Ocean Gate uses municipal manpower and equipment for collection and disposal of solid wastes generated within the Borough. Approximately 1000 residential units are provided three curbside collections per week during July and August and twice-weekly collection for the remainder of the year. Approximately ten commercial establishments contract with Caldeira Brothers for the collection and disposal of their solid wastes.

All solid wastes collected by the municipality are hauled to a centrally located dumping area within the Borough where it is stored until it is transferred to the Southern Ocean Landfill, Inc. The transfer lot is within quick access from all parts of the municipality. Solid wastes reportedly can be held in the lot from one to six days before transfer to the landfill.

The costs to the municipality for these services include $19,000. for collection, and $5,500. for disposal, for a total cost of $24,500. per year.

Additionally, the municipality generally provides the first week in June as its annual clean-up week. Leaf collection is included in the weekly pickup as is the collection of municipal debris. Road sweepings are used as an inert fill within the Borough.

BOROUGH OF PINE BEACH

Pine Beach Borough utilizes a municipal collection system to service the Borough's 761 residential units, 5 commercial units, and 3 institutional units. Additionally, Caldeira Brothers of Toms River services some 35 commercial units. The municipality provides twice-weekly curbside collection for the solid wastes generated in the municipality.

Additionally, every October and April, at a date specified by the Mayor and Council, the Borough conducts clean-up operations. The same municipal manpower and equipment is used for the clean-up operation, and the costs are included in the municipal solid waste budget. The municipality collects leaves and brush every Wednesday. The costs for leaf collection and disposal, in addition to the costs for street sweepings and municipal debris collection, are included in the municipal solid waste budget.

The costs of the various services to the municipality include $12,911. for collection and $8,085. for disposal per year.

All solid wastes generated within the municipality are hauled to the Southern Ocean Landfill, Inc., in Waretown, some 42 round-trip miles away.

TOWNSHIP OF PLUMSTED

The residents of the Township of Plumsted contract privately with a solid waste contractor for the collection and disposal of solid wastes. According to municipal officials, the New Egypt Salvage Company of Cream Ridge, New Jersey services most of the residential and commercial units. The contractor provides curbside pickup once a week to 1,022 residential units and 60 commercial units. In addition, many homeowners haul their own solid wastes.

The Township provides two clean-up days in the spring when residents may place large or bulky items at the curb for collection. The cost of this service is reportedly $1,200. There are no provisions for leaf collection and Ocean County does the street sweeping.

Presently, all solid wastes generated in Plumsted are hauled to the Township sanitary landfill located off Lakewood Road near Route 539 in Plumsted. The landfill accepts household and commercial solid wastes which are generated within Plumsted only. Reportedly, the annual municipal solid waste budget allocates $12,000. for operation and maintenance of the landfill.

## BOROUGH OF POINT PLEASANT

The Borough of Point Pleasant employs the private collection firm of Waste Disposal, Inc., of Neptune in Monmouth County for the collection and disposal of solid wastes generated in the Borough. The contract, which runs from December 13, 1974 to December 31, 1977, has a total cost of $752,605. for the three years. The municipal contractor provides twice-weekly curbside collection to the residential, some commercial, and some industrial units in the Borough. In addition, James Whaley of Point Pleasant provides collection and disposal services to some commercial and industrial units. The contractors provide three pick-ups per week during the summer months.

In addition, the Borough provides two clean-up weeks in the summer and one clean-up week in the fall. The estimated cost for these services is $25,000. per year. The Borough also collects leaves placed at the curb by the residents with three vacuum machines. Street sweeping is done by Borough equipment and a chipper is utilized for tree limb disposal.

Currently, all solid wastes generated within Point Pleasant and collected by the municipal contractor are hauled to the contractor's own landfill located in Howell Township in Monmouth County, some 18 round-trip miles away.

## BOROUGH OF POINT PLEASANT BEACH

The Borough of Point Pleasant Beach utilizes a municipal collection system to service most of the Borough's residential units. All of the 2,000 single-family homes and the majority of the multi-family units are provided three curbside collections per week during the summer months, and two collections per week during the rest of the year. The larger apartment complexes and the commercial firms, in addition to some beachfront bungalows, contract with one of six private solid waste contractors serving the municipality. The private contractors include: Waste Disposal, Inc., of Neptune, Marpal Company, of Long Branch, Ernest Wilbert of Bricktown, Wilenta Brothers of Lakewood, C. Seems and Sons of Collingwood Park, Monmouth County, and Pope Disposal. The rates charged by the private contractors vary depending on the waste quantities and level of service.

In addition, the Borough's residents are allowed to place large or bulky clean-up materials at the curb either one day in the spring or a day in the fall. The Borough collects leaves with a vacuum machine and disposes of them into low lots for use as mulching. Road sweepings are picked up with a sweeper and deposited into low-lying areas as fill. The costs for all of these services are included in the municipal solid waste budget.

The Borough's budget for solid waste collection is $62,650. annually, and for disposal, is $20,500. All wastes generated within the Borough and serviced by the municipal collection system are hauled to the disposal site owned by Waste Disposal, Inc., in Howell Township, Monmouth County. In addition, some industrial waste is hauled to James H. James Inc., a private fill located in Brick Township.

## BOROUGH OF SEASIDE HEIGHTS

The Borough of Seaside Heights utilizes a municipal collection system to service the 2,500 residential units and 800 commercial firms in the Borough. The municipality provides pick-up at the curb seven days per week during the summer and three days per week during the winter. In addition, a new condominium development contracts privately with Valente Brothers of Toms River for their collection and disposal services.

There is no set clean-up week, but residents can contact the municipality for disposal of trash and building material. The costs for this service are $8,000. annually.

The annual municipal solid waste budget includes $65,000. for collection and $18,000. for disposal for a total cost of $83,000. Road sweeping and municipal debris collection is done by municipal manpower and equipment. This material is used as an inert fill in the Borough. All solid wastes generated in the Borough are presently hauled to the Ocean County Landfill Corporation in Manchester Township, some 26 round-trip miles away.

## BOROUGH OF SEASIDE PARK

Seaside Park Borough provides a municipal collection system for the collection of residential and commercial solid wastes. The 1,600 residential units are provided backyard pick-up three times per week from June to September and twice-weekly collection from October to May. The 100 commercial establishments are provided seven collections per week June to September and twice-weekly collections the remainder of the year.

Additionally, the Borough provides 24 days per year when large or bulky clean-up items are collected. There are no provisions for leaf collection and all road debris and sweepings are hauled for disposal to the Berkeley Township Landfill. There is no fee for the disposal because Seaside Park provides fire protection for South Seaside Park, a section of Berkeley Township.

The costs for these services are $72,300. for collection and disposal. All residential and commercial solid wastes are hauled to the Berkeley Township Landfill located on Forest Hills Parkway in Berkeley Township.

## BOROUGH OF SHIP BOTTOM

The Borough of Ship Bottom utilizes a municipal collection system to collect and dispose of the solid wastes generated in the Borough. The Borough provides curbside pickup 3 days per week during the summer and twice a week during the winter.

In addition, the municipality provides a one-week clean-up period in May when residents are allowed to place large or bulky items at the curb for collection. Reportedly, the clean-up service costs the municipality about $800. per year. There are no provisions for leaf collection, municipal debris collection and abandoned automobiles are impounded for auction.

Currently, all solid wastes generated in Ship Bottom are hauled to the Southern Ocean Landfill, Inc., located in Ocean Township, some 28 round-trip miles away.

According to municipal officials, the annual municipal solid waste budget allocates $38,000. for collection, and $13,000. for disposal at Southern Ocean Landfill, Inc. in Waretown.

## BOROUGH OF SOUTH TOMS RIVER

The Borough of South Toms River utilizes a municipal collection system to service the residential units in the Borough with twice-weekly curbside collection. Reportedly, Caldeira Brothers of Toms River services some 100 commercial establishments. Large or bulky items are picked up once-a-month in a clean-up operation. There are no special provisions for leaf collection, and the Road Department cleans the streets.

The estimated cost for these services is $27,100. for collection and $4,205. for disposal annually. At the present time, the solid wastes are hauled to the Borough's own landfill located within the municipality. The travel times and haul distances to the disposal site are negligible.

## TOWNSHIP OF STAFFORD

The Township of Stafford employs a municipal collection system to collect and dispose of the solid wastes from the Township's 3,768 residential units and 146 commercial firms. In addition, Caldeira Brothers of Toms River reportedly services 200 commercial and industrial units, depending on their needs.

The municipality additionally specifies one day per week when large or bulky clean-up items are collected for disposal. The Township has no special arrangements for leaf collection nor for municipal debris collection.

According to municipal sources, the annual solid waste budget in 1975 includes $93,000. for salaries and wages, $52,000. for disposal, and $36,000. for other expenses for a total yearly expenditure of $181,000.

All solid wastes collected in Stafford by municipal equipment and manpower are presently hauled to the Stafford Township Municipal Landfill on Recovery Road in the Township. The 350-acre facility is a short haul from all parts of the municipality. According to municipal officials, the estimated life of the landfill is 100 years.

BOROUGH OF SURF CITY

Surf City Borough operates its own municipal collection system to service the Borough's 1,800 residential units and 10 commercial establishments. In addition, Caldeira Brothers of Toms River reportedly collects from an additional 20 commercial firms. The residential and commercial firms have curbside collection two days per week. Additionally, the Borough collects large or bulky clean-up materials during the month of June. The cost for the clean-up is $2,000. annually. The Borough has no leaf collection program and road sweepings are used to fill low lots within the Borough's borders.

The municipal solid waste budget includes $33,900. for collection and $12,000. for disposal for a total cost of $46,900. per year. Currently, the Borough hauls its solid wastes to the Stafford Township Landfill, some 18 round-trip miles away.

BOROUGH OF TUCKERTON

The Borough of Tuckerton has a municipally-operated system for the collection and disposal of solid wastes generated within the Borough. The 1,275 residential units are afforded twice-weekly curbside collection. In addition, residents may place large or bulky clean-up materials at the curb for pickup on every Wednesday. The municipality also collects leaves on the Wednesday collection route. Street sweeping is done by the County. The costs for these municipal services are estimated at $40,000. for collection, $6,000. for disposal, and $3,000. for clean-up, for a total of $49,000. annually.

The Borough currently hauls the residential solid wastes to the Tuckerton-Eagleswood Township Landfill located on Forge Road in Eagleswood Township. The landfill is about 10 round-trip miles from Tuckerton Borough.

TOWNSHIP OF UNION

The Township of Union has a contract with the private collection firm of Caldeira Brothers of Toms River for the collection and disposal of residential and some commercial solid wastes generated in Union Township. In addition, some larger commercial establishments and the industrial firms contract privately with a private scavenger for their collection needs.

The municipal contractor provides the 1,544 residential units and some of the 57 commercial firms with twice-weekly curbside service. Also, the municipality has a clean-up operation once in the spring and once in the fall when residents are allowed to place large or bulky items at the curb for collection. There is no organized leaf collection and County sweepers clean the streets.

The cost to the municipality for the above services include $55,000. for collection, $10,000. for disposal, and $1,500. for clean-up, for a total of $66,500. annually.

Currently, the municipal contractor hauls the solid wastes to Southern Ocean Landfill, Inc., in Ocean Township.

## EXISTING LANDFILLS SERVICING OCEAN COUNTY

All of the residential solid wastes and the vast majority of agricultural, commercial, institutional, and industrial solid wastes generated in Ocean County are hauled to landfills for disposal. The following section gives a detailed analysis of each of the landfills both within and outside Ocean County that accept solid waste from the County. The information was obtained from files of the New Jersey Department of Environmental Protection, the Public Utilities Commission, and interviews with municipal officials. Table IV-5 **lists the disposal** areas utilized by the Ocean County municipalities. Figure IV-2 illustrates the general patterns of solid waste disposal in Ocean County.

## BEACHWOOD MUNICIPAL LANDFILL

The Borough of Beachwood operates its own municipal sanitary landfill. The disposal site, located on Pinewald Road in Beachwood, is reportedly 32 acres in size. Currently, all solid wastes, including household garbage and trash, commercial waste, bulky items, tree stumps, leaves and branches, generated in the Borough are hauled to the landfill.

TABLE IV-5

OCEAN COUNTY SOLID WASTE STUDY

SOLID WASTE DISPOSAL SITES UTILIZED BY OCEAN COUNTY MUNICIPALITIES

| MUNICIPALITY | DISPOSAL SITE | LOCATION |
|---|---|---|
| BARNEGAT LIGHT | Southern Ocean Landfill Inc. | Ocean Township |
| BAY HEAD | Lakewood Landfill | Lakewood Township |
| BEACH HAVEN | Southern Ocean Landfill Inc. | Ocean Township |
| BEACHWOOD | Beachwood Landfill | Beachwood |
| BERKELEY | Berkeley Landfill | Berkeley Township |
| BRICK | Brick Landfill | Brick Township |
| | Burge's Landfill (Municipal debris only) | Brick Township |
| DOVER | Dover Landfill | Dover Township |
| | Lone Pine Landfill (some industrial waste) | Freehold Township, Monmouth County |
| EAGLESWOOD | Tuckerton-Eagleswood Landfill | Eagleswood Township |
| HARVEY CEDARS | Southern Ocean Landfill Inc. | Ocean Township |
| ISLAND HEIGHTS | Southern Ocean Landfill Inc. | Ocean Township |
| JACKSON | Jackson Landfill | Jackson Township |
| | Lakewood Landfill (Industrial & commercial) | Lakewood Township |
| LACEY | Lacey Landfill | Lacey Township |
| LAKEHURST | Lakehurst Landfill | Lakehurst |
| LAKEWOOD | Lakewood Landfill | Lakewood Township |
| LAVALLETTE | Ocean County Landfill Corp. | Manchester Township |
| LITTLE EGG HARBOR | Little Egg Harbor Landfill | Little Egg Harbor |
| LONG BEACH | Stafford Landfill | Stafford Township |
| MANCHESTER | Manchester Landfill (Residential only) | Manchester Township |
| | Ocean County Landfill Corp. | Manchester Township |
| MANTOLOKING | Shrewsbury Disposal | Colts Neck, Monmouth County |

TABLE IV-5, CONTINUED

OCEAN COUNTY SOLID WASTE STUDY

SOLID WASTE DISPOSAL SITES UTILIZED BY OCEAN COUNTY MUNICIPALITIES

| MUNICIPALITY | DISPOSAL SITE | LOCATION |
|---|---|---|
| OCEAN | Southern Ocean Landfill Inc. | Ocean Township |
| OCEAN GATE | Ocean Gate Transfer Site to Southern Ocean Landfill Inc. | Ocean Township |
| PINE BEACH | Southern Ocean Landfill Inc. | Ocean Township |
| PLUMSTED | Plumsted Landfill | Plumsted Township |
| POINT PLEASANT | Waste Disposal Inc. | Howell Township, Monmouth County |
| POINT PLEASANT BEACH | Waste Disposal Inc. | Howell Township, Monmouth County |
| SEASIDE HEIGHTS | Ocean County Landfill Corp. | Manchester Township |
| SEASIDE PARK | Berkeley Landfill | Berkeley Township |
| SHIP BOTTOM | Southern Ocean Landfill Inc. | Ocean Township |
| SOUTH TOMS RIVER | South Toms River Landfill | South Toms River |
| STAFFORD | Stafford Landfill | Stafford Township |
| SURF CITY | Stafford Landfill | Stafford Township |
| TUCKERTON | Tuckerton-Eagleswood Landfill | Eagleswood Township |
| UNION | Southern Ocean Landfill Inc. | Ocean Township |

# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

## SOLID WASTE DISPOSAL SITES UTILIZED BY OCEAN COUNTY MUNICIPALITIES

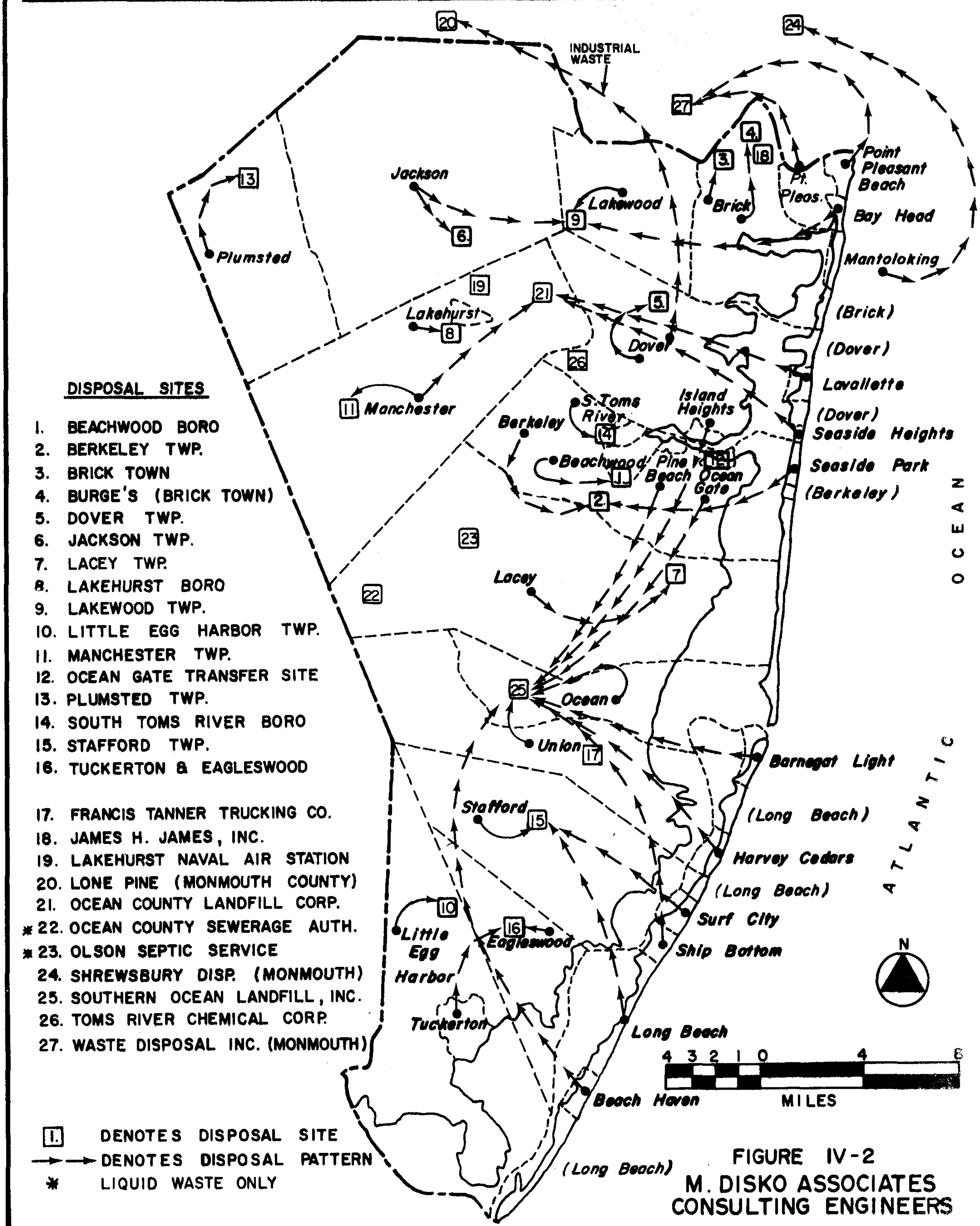



FIGURE IV-2

M. DISKO ASSOCIATES
CONSULTING ENGINEERS

FIG. IV-3 BEACHWOOD BOROUGH MUNICIPAL LANDFILL.
VIEW LOOKING SOUTH.

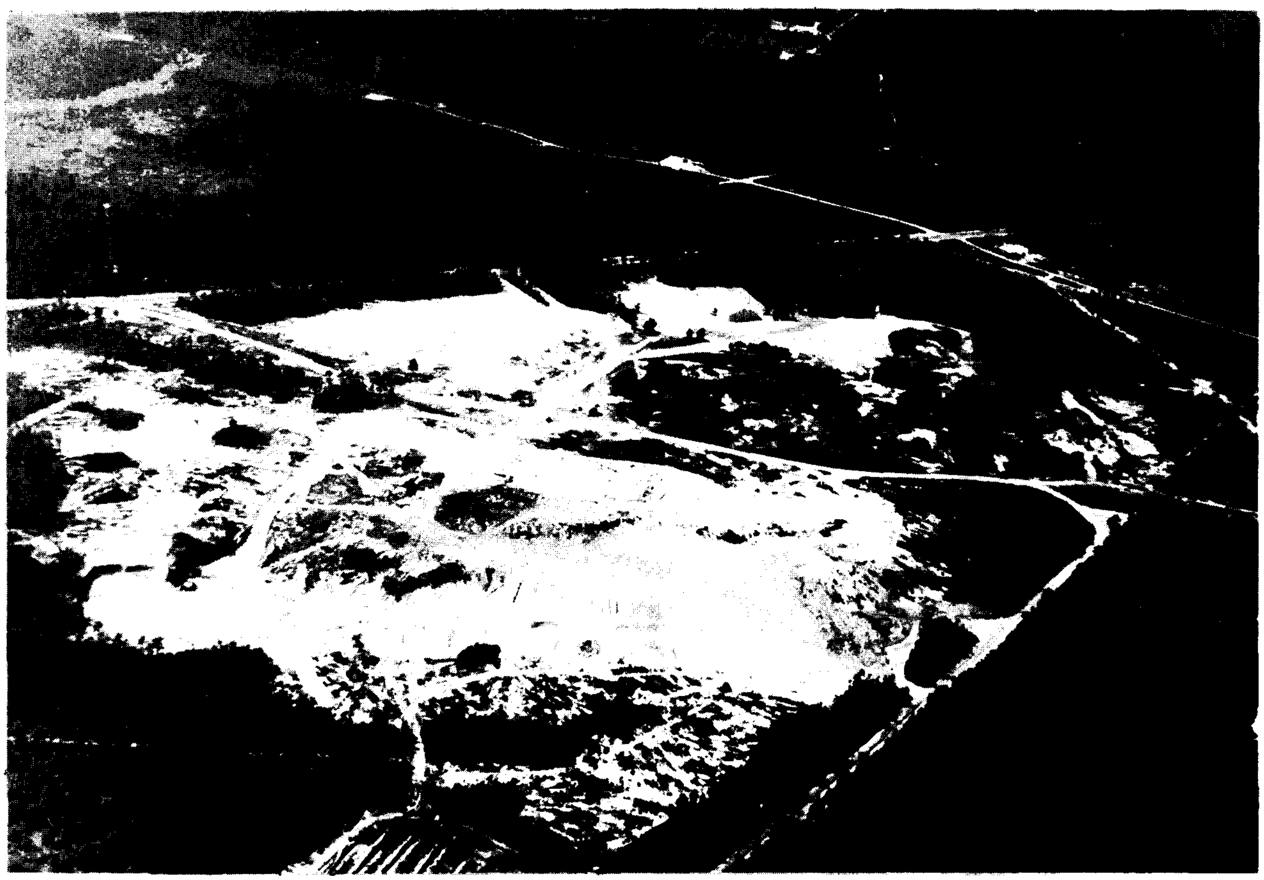


FIG. IV-4 BERKELEY TOWNSHIP MUNICIPAL LANDFILL.
VIEW LOOKING SOUTHWEST.

The landfill uses the trench and area methods of filling. Fire protection is provided by the local fire department. Reportedly, about 25 cubic yards of cover material must be trucked to the fill daily. A one and one-half cy front end loader is used to compact refuse and spread the cover fill material.

According to municipal officials, the landfill has an expected life of three years. The 1973 municipal solid waste budget included $18,500. for the operation of the landfill. The landfill is industrially zoned and it is surrounded by light industry.

BERKELEY TOWNSHIP SANITARY LANDFILL

The Public Works Department of the Township of Berkeley operates a sanitary landfill on Pinewald Keswick Road in Berkeley. The landfill is reportedly about 145 acres in size and accepts household, commercial, and institutional solid wastes, bulky clean-up items, leaves, tree stumps, branches and sewage sludge. The fill will not accept industrial nor septic wastes. Besides Berkeley Township, Seaside Park also hauls to the Berkeley landfill. The soil at the landfill is generally sand and gravel with a sandy top soil and some scrub oaks and pine. The landfill has a sufficient amount of cover material on site to serve its needs. Currently, the fill is using the area method of disposal. The area is zoned rural.

The landfill utilizes an Allis Chalmers HD-11 bulldozer to compact the refuse and spread cover material. Fire protection consists of a 30-foot wide fire lane with a stockpile of cover material to smother a fire. The Bayville Fire Department can also assist.

The landfill estimates that about 125 trucks per week enter the fill during June, July, and August, and that about 60 trucks per week use it the remainder of the year. The expected life of the landfill is 15 years.

BRICK TOWN MUNICIPAL LANDFILL (FRENCH'S)

The Township of Brick owns and operates a municipal landfill located on Sally Ike Road in Brick Town. The disposal site, formerly known as French's, accepts solid and liquid waste including garbage, trash, dead animals, building rubble, leaves, branches, tree stumps, commercial wastes, septic wastes and clean-up wastes. Currently, the landfill is accepting solid wastes from Brick Township and two Monmouth County municipalities. However, some 24 septic waste contractors servicing Ocean County haul septic wastes to Brick Town landfill for disposal.

The subsurface soils are granular, marine stratified deposits with occasional lenses of clay. The soil is dense, reportedly providing a mechanism for filtering leaching water from the landfill operation.

The septic trenches are reportedly cut to 7 feet above groundwater and filled with septic wastes in 12-foot lifts. Several trenches are filled with brush and construction debris to provide absorbtion for the septic wastes. The trenches are provided a two-foot final cover.

The trash and garbage landfilling is by the area method with 12-foot maximum lifts. The compacted refuse is covered with 6 inches of soil at the end of the day's operation and intermediate stages receive 12 inches of cover.

The engineering design data provides the following information:

- Average population to be served 1971 to 1986 = 40,000
- Fill per capita = 3 pounds per capita per day
- Compaction densities = 700 pounds per cubic yard
- Daily filling = 200 cy (1971)
- Annual fill = 32 acre-ft.
- Total fill = 800 acre-ft.
- Life expectancy = 25 years (1971 figures)
- Total acreage = $41^{\pm}$ acres

The site provides a sufficient amount of suitable cover to serve the landfill's requirements. The equipment used includes a Caterpillar 966C 4-cy loader, a Caterpillar D6C bulldozer and a Ford tandem dump truck. Two additional loaders and 6 dump trucks are held in standby reserve.

Fire protection is provided by using cover material to smother the fire. The landfill site is zoned for a landfill and the surrounding area is rural.

In 1973, while the landfill was still operating as the private fill known as French's, the following revenues were collected:

| | |
|---|---|
| . Boroughs of Seaside Heights and Lavallette 1,020 truckloads @ $25.00/load | = $ 25,500.00 |
| . Borough of Spring Lake (Monmouth County) 104 truckloads @ $25.00/load | = $ 2,600.00 |

- Township of Brick (under contract) 5,000 truckloads = $ 40,000.00

- Boroughs of Mantoloking and Brielle and 25 building contractors - 350 truckloads @ $8.00/load average = $ 2,800.00

- Septic wastes from 30 contractors 18,200,000 gallons @ $2.50/1000 gallons = $ 45,500.00

Total $116,400.00

After the Township of Brick assumed control of the facility, the Boroughs of Seaside Heights, Mantoloking and Lavallette began hauling their solid wastes to other landfills. The following fee schedule is now in effect at the landfill:

| Material | Rate |
|---|---|
| Closed roll-off | $1.35 per cubic yard |
| Normal commercial or industrial trash in packer trucks or open roll-offs | $1.10 per cubic yard |
| Building debris | $1.00 per cubic yard |
| Bulk waste | $2.00 per cubic yard |
| Brush | $1.00 per cubic yard |
| Logs | $1.50 each |
| Septic waste or liquid sewer waste | $2.50 per thousand gallons |

In addition, after transferral of the landfill operation to Brick Township, new criteria and guidelines went into effect including the following:

- Septic waste is limited to 75,000 gallons per day.
- No industrial or chemical wastes will be accepted.
- All new trash and garbage areas will be lined with PVC or butyl rubber.
- No refuse will be placed within 50 feet of boundaries.
- Four wells will monitor leachate.

FIG. IV-5 BRICK TOWNSHIP MUNICIPAL LANDFILL (FORMERLY FRENCH'S).
VIEW LOOKING NORTHEAST.

FIG. IV-6 DOVER TOWNSHIP MUNICIPAL LANDFILL.
VIEW LOOKING NORTHEAST.

- Leachate will be collected and treated with septic wastes.

- All septic wastes will be treated in a Purefax treatment plant and sprayed on the working face of the filling operation.

## BRICK TOWN MUNICIPAL LANDFILL (BURGE'S)

The Township of Brick also operates a sanitary landfill on Ridge Road in the Township for municipal waste only. The facility utilizes the trench method with 100-foot long by 18 to 20-foot wide by 20-foot deep trenches. The excavated material is used as cover.

The soil is coarse and fine sands with isolated lenses of clay. The highest water table is about 50 feet from the surface.

The landfill accepts trash, tires, appliances, building rubble, tree stumps, branches and leaves from Brick Township. The disposal site has about 46 acres to landfill and it is estimated by municipal officials that it will last about 15 years. Burge's is only open to receive trash and debris from Brick Township residents.

## DOVER TOWNSHIP MUNICIPAL LANDFILL

The Township of Dover maintains a landfill on Bay Avenue and Church Road in Toms River for the disposal of solid wastes generated in Dover Township. The facility accepts household trash and garbage, commercial waste, bulky clean-up items, tires, leaves, tree stumps, and branches.

The facility reportedly has 91 acres that can be landfilled. The area has no groundcover and there is a sufficient amount of cover material on site to meet the needs of the landfilling operation.

The equipment used on the landfill includes an Allis Chalmers bulldozer, an Allis Chalmers loader, a John Deere loader and two trucks. The facility has a water wagon that can be used for fire prevention and fill dirt can be used to smother any fire. In addition, the landfill can be serviced by the local Fire Departments.

Currently, the disposal facility accepts wastes generated in Dover Township. The Township's annual municipal solid waste budget includes $35,000. for operation of the landfill. The area surrounding the disposal site is zoned rural. The landfill reportedly has a 5-year life expectancy.

## JACKSON TOWNSHIP MUNICIPAL LANDFILL

The Township of Jackson maintains its own sanitary landfill off Homestead Road in Jackson Township. The facility is open for use by the private contractors servicing the municipality's residents and also to any resident who wishes to haul the waste himself. Reportedly, the private contractors do not use the Jackson Landfill. Instead, the contractors haul to the Lakewood Landfill in Lakewood Township.

The landfill reportedly has 135 acres of land and the trench method is being used to dispose of the septic wastes and the area method is used for the remaining garbage and trash. The facility accepts, for disposal, all items except chemical wastes.

The facility utilizes trench excavation for cover material and no extra fill need be trucked to the site. The landfill uses a Caterpillar D-8 crawler dozer and a rubber-tired loader for refuse compaction and cover application. The landfill relies on volunteer fire companies to extinguish any fires which may start. During the period of January 1, 1974 through June 31, 1974, the landfill reportedly counted 18,829 passenger cars and 4,047 pick-up trucks using the site. In addition, the Jackson Township Department of Public Works hauls leaves, grass, branches, and clean-up items to the landfill. According to landfill records, some 1,239 trips to the site were made during the January to June time period, with a peak of 401 trips made during the spring clean-up month of May 1974.

The 1974 annual municipal solid waste budget includes $40,000. for operation of the landfill. Currently, the landfill is charging the following rates for disposal:

| Material | Rate |
|---|---|
| 20 cy vehicle or 4 tons, whichever is greater | $5.00 per load |
| 16 cy vehicle or 3 tons, whichever is greater | $3.50 per load |
| 9 cy vehicle or 0.5 tons, whichever is greater | $2.00 per load |
| Domestic garbage and rubbish in open body vehicle and non-compacted | $1.00 per cy |
| All other materials, building debris, trees, weeds, commerical and industrial garbage and rubbish | $1.10 per cy |
| Compacted refuse | $1.20 per cy of capacity of vehicle |

FIG. IV-7 JACKSON TOWNSHIP MUNICIPAL LANDFILL.
VIEW LOOKING SOUTHEAST.

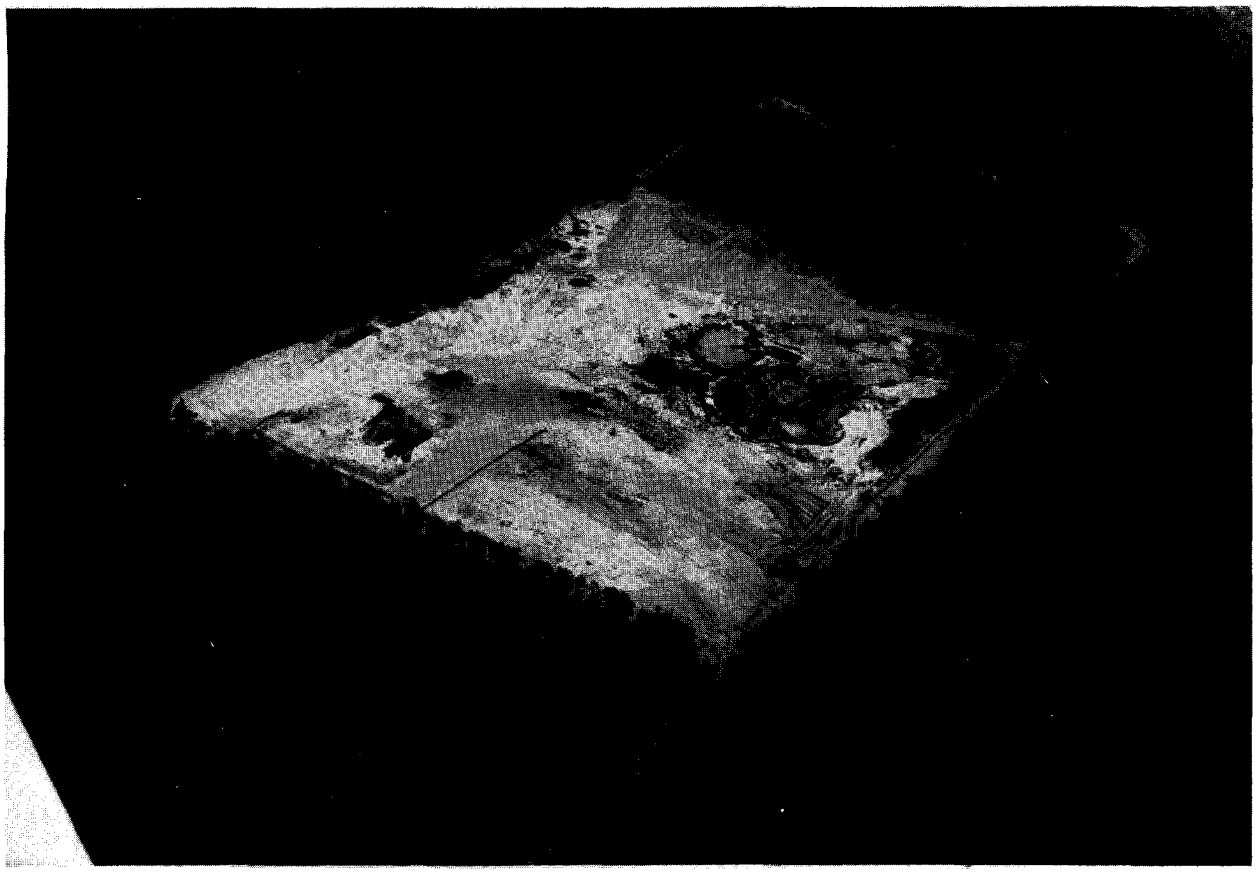


FIG. IV-8 LACEY TOWNSHIP MUNICIPAL LANDFILL.
VIEW LOOKING NORTHEAST.

| Material | Rate |
|---|---|
| Septic waste | $6.00 per 1000 gallons of capacity of vehicle |
| Minimum charge | $8.00 |
| Residents | Free |

## LACEY TOWNSHIP MUNICIPAL LANDFILL

The Township of Lacey operates its own municipal landfill located behind the Public Works Building on Lacey Road in Lacey Township. The 11-acre site services the municipal residential collection system and the private contractors that collect the commercial and industrial solid wastes. However, the landfill has the potential to expand to adjacent areas when the present site is exhausted. Aerial photographs reveal no development near the existing site.

The landfill currently accepts household trash and garbage, commercial, and institutional waste, bulky clean-up items, tires, leaves, sewage sludge, and other lawn debris. The groundcover is, at the landfill, coarse sand and gravel and some additional cover material for the fill must be trucked to the site. The equipment at the site reportedly includes a Caterpillar 920 front end loader and a Caterpillar 951 front end loader. In addition, a 10,000-gallon water tank wagon and a 4,000-gallon fire engine are available to fight any fires which may arise.

The landfill accepts approximately 40 Township trucks per week and three trucks from private contractors. The annual municipal solid waste budget includes $19,500. for operation of the landfill.

## LAKEHURST BOROUGH MUNICIPAL LANDFILL

The Borough of Lakehurst operates its own municipal landfill on Myrtle Street in Lakehurst. The 32.5-acre site accepts solid wastes generated from the Borough's residential and industrial units. The landfill will take household, commercial, and institutional solid wastes, bulky clean-up items, tires, leaves, branches, etc., and sewage sludge.

The landfill utilizes the area method. The site has sufficient quantities of suitable cover material to meet the landfilling needs. The equipment used includes a Caterpillar 951 crawler loader. The landfill utilizes the services of the Lakehurst Fire Company and the Naval Air Station Fire Company for fire protection.

The fill accepts approximately 10 truckloads per week from the Borough.

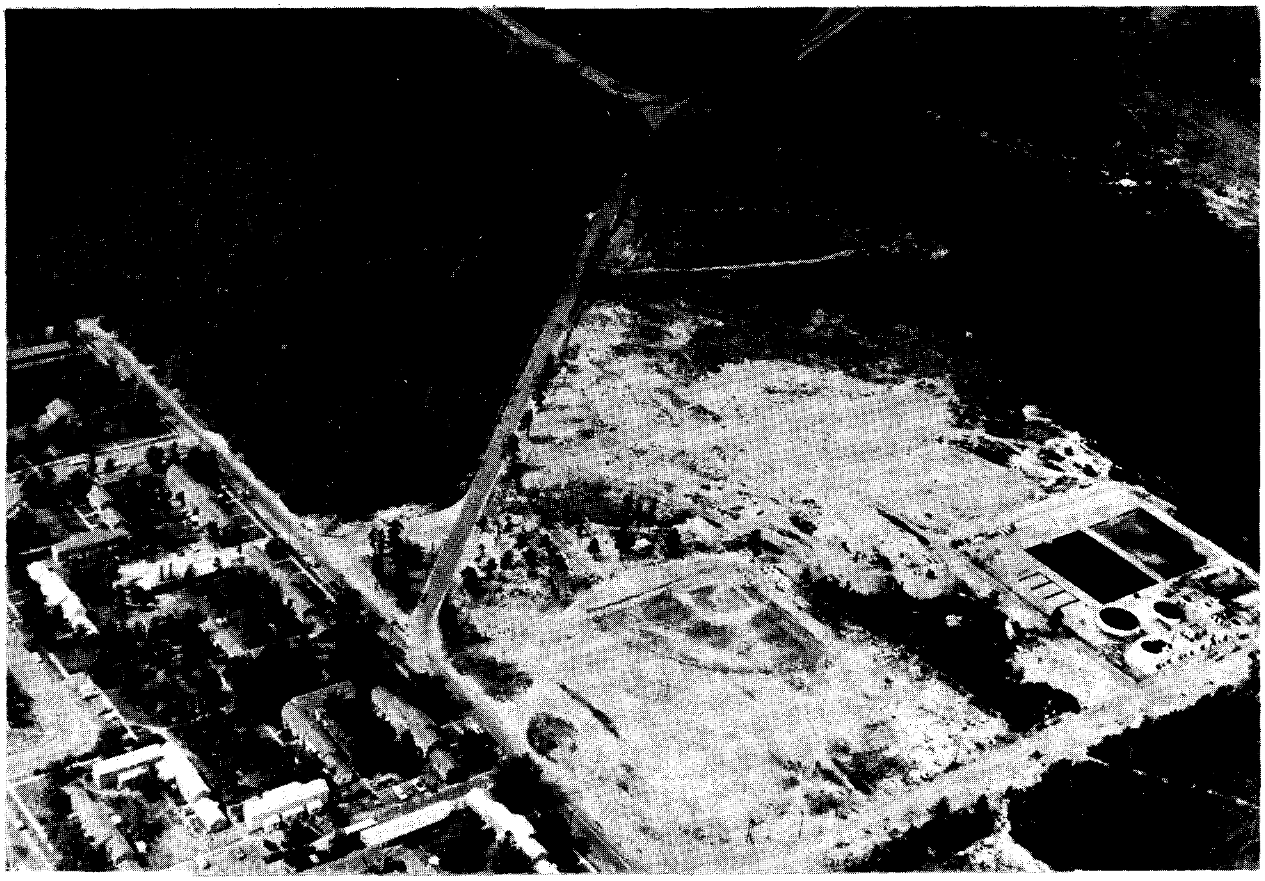


FIG. IV-9 LAKEHURST BOROUGH MUNICIPAL LANDFILL.
VIEW LOOKING NORTHWEST.

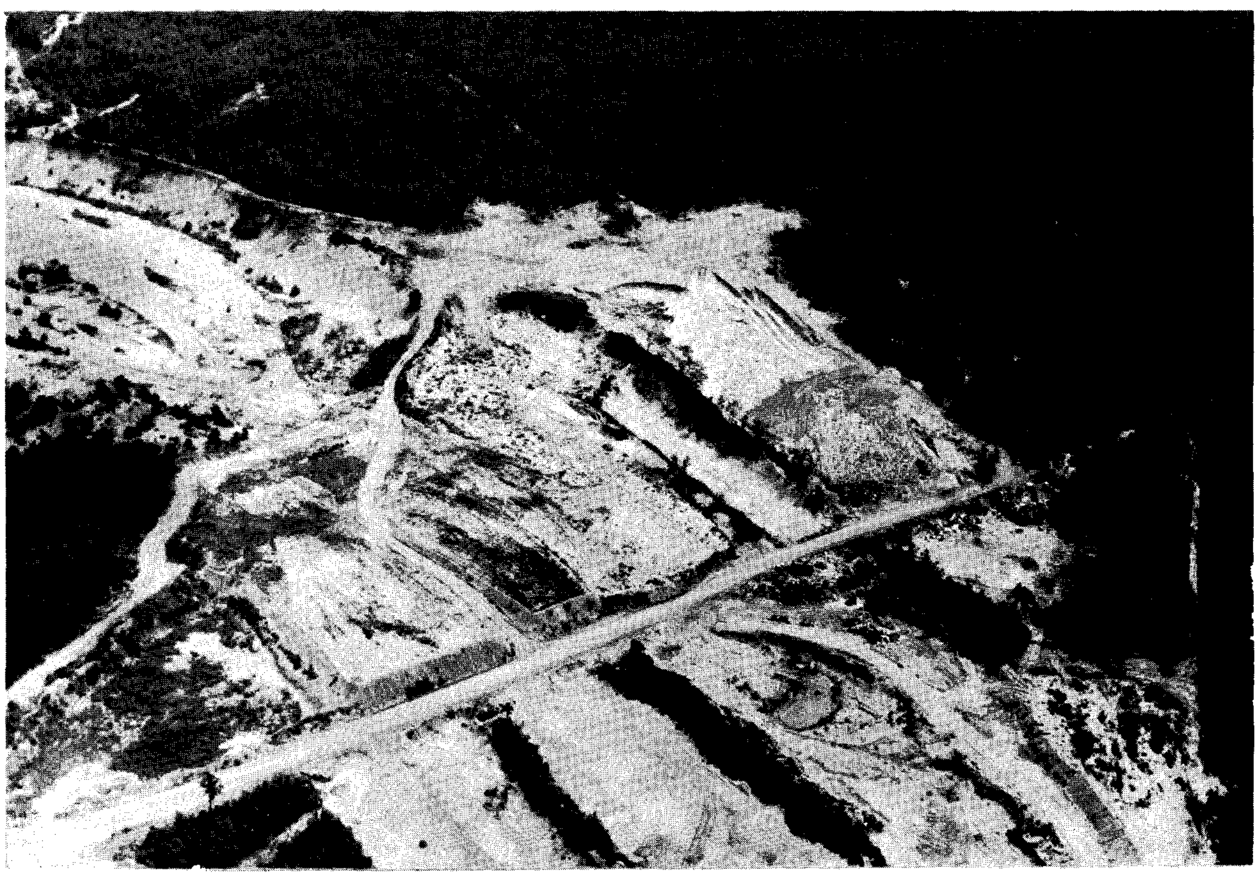


FIG. IV-10 LAKEWOOD TOWNSHIP MUNICIPAL LANDFILL.
VIEW LOOKING SOUTHEAST.

## LAKEWOOD TOWNSHIP MUNICIPAL LANDFILL

The Township of Lakewood operates its own municipal landfill on 62 acres of land on Farraday Avenue in Lakewood Township. Presently, the Township is landfilling on about 2 acres of land.

The soils at the landfill consist of well-graded and gravelly sands, some fine sands, some poorly graded sands, and some sands with traces of clay and silt. The groundcover consists of wooded areas with oak, pine, and similar trees.

Currently, the landfill is using the trench method of landfilling. Excavation from the trenches provides sufficient cover material to meet the needs of the facility.

The equipment used at the site includes a Caterpillar 966 front end loader, a Caterpillar D-6 dozer, and, for fire protection, a 5,000-gallon tanker equipped with pumps.

According to landfill records, in 1973 there were an average of 5 municipal collection trucks per day for 4 days a week using the landfill. In addition, about 6 trucks per day for 5 days per week from private contractors used the fill. Upon completion of the landfilling operation, the Township plans a recreation area and light industrial building.

The annual municipal solid waste budget includes $38,800. for operation of the landfill, not including salaries.

According to Public Utility Commission tariffs, the landfill uses the following fee schedule:

| Material | Rate |
|---|---|
| Less than 9 cy packer | $1.00 per load |
| 9-12 cy packer | $2.00 per load |
| 12-16 cy packer | $3.50 per load |
| 16-20 cy packer | $5.00 per load |
| Sludge | $1.00 per stop |
| Building demolition | $5.00 per room |

## LITTLE EGG HARBOR MUNICIPAL LANDFILL

Little Egg Harbor operates a sanitary landfill on Forge Road for disposal of solid wastes and septic tank sludges generated in the Township. The landfill accepts household,

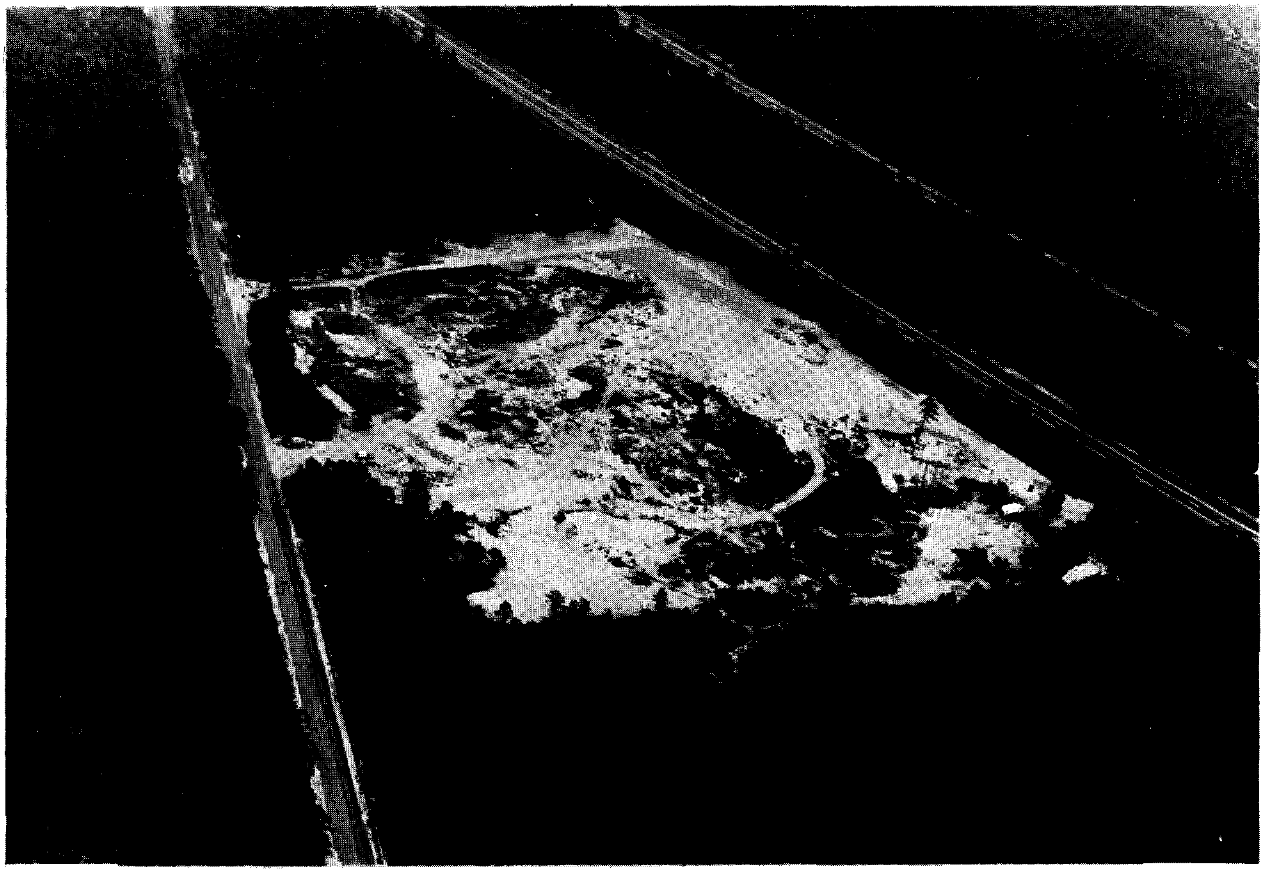


FIG. IV-11 LITTLE EGG HARBOR TOWNSHIP MUNICIPAL LANDFILL.
VIEW LOOKING NORTHEAST.

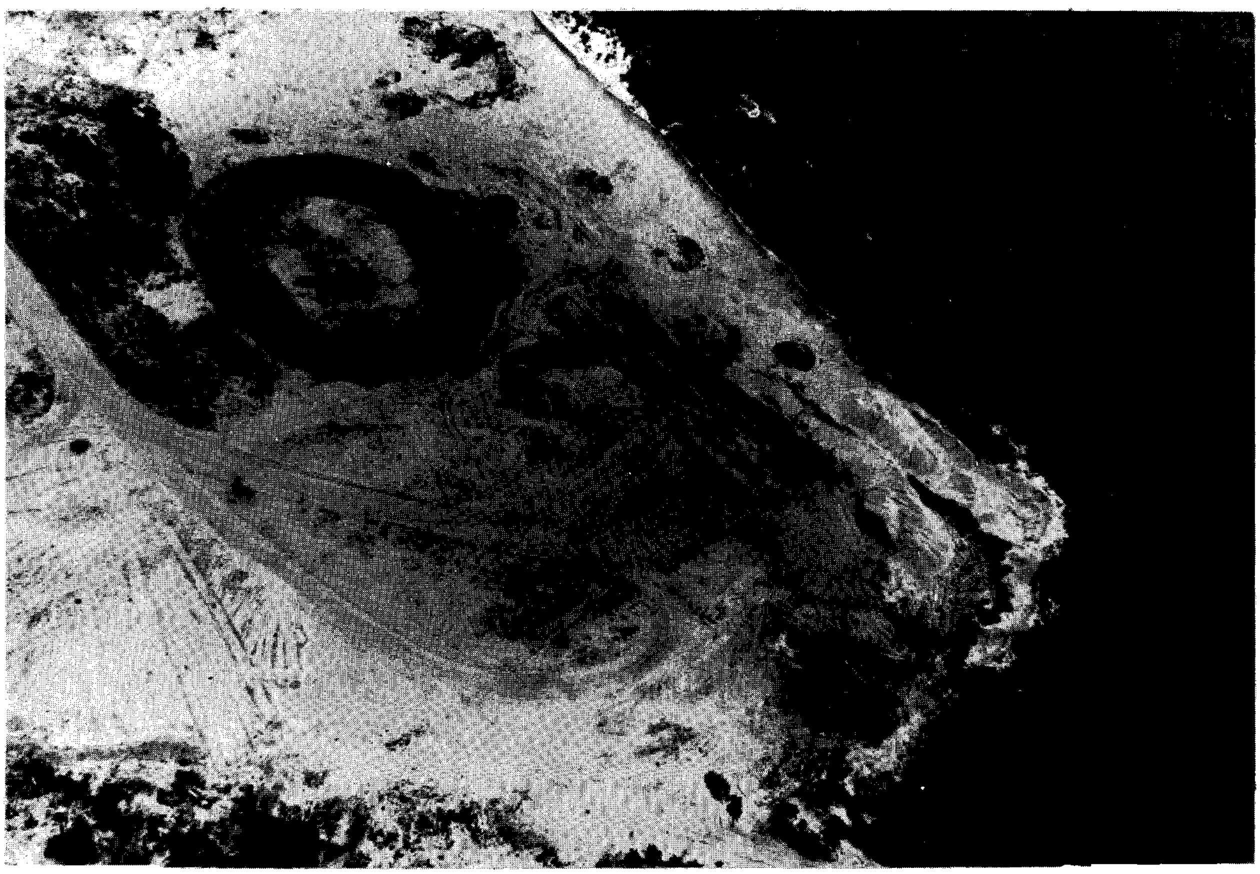


FIG. IV-12 MANCHESTER TOWNSHIP MUNICIPAL LANDFILL.
VIEW LOOKING SOUTHEAST.

commercial, industrial, institutional and agricultural wastes, sewage sludges, septic cleaning, clean-up items, etc.

The Township is currently landfilling on 10 acres of land which they estimate will last 2 to 3 years. They have at least 111 acres of land on which to expand the operation when necessary.

The soil at the site consists of a 13-foot sand layer over 3 feet of clay. The water table is 15 feet below the surface. The facility is currently using the area method of landfilling. Sufficient cover material is not available on site. Reportedly, approximately 50 cy of additional cover material is needed on the landfill daily.

The equipment used at the landfill consists of a 20-ton bulldozer. Fire protection is provided by the Little Egg Harbor Fire Company. According to landfill records, approximately 4 trucks per week from the municipality use the landfill.

MANCHESTER TOWNSHIP MUNICIPAL LANDFILL

The Manchester Township Road Department operates a sanitary landfill on Route 70, one mile west of County Route #539. The disposal facility accepts household wastes, yard debris, septic wastes, tires, etc., from Manchester Township residents only. The landfill is open on Tuesdays and Thursdays from 8 AM to 4 PM.

Currently, on the 185-acre tract, the trench method of landfilling is being used. Excavation from the trenches provides sufficient cover material to meet the needs of the landfilling operation. A Caterpillar D-6 bulldozer is used at the site. The local fire department is used for fire protection purposes. The landfill site is zoned for rural-agriculture purposes.

According to landfill records, about 10 trucks per week from the Manchester Township Road Department use the landfill. Approximately 5 trucks per week from private contractors and 7 tank trucks with septic waste use the landfill each week.

OCEAN GATE TRANSFER SITE

The Borough of Ocean Gate utilizes a transfer site for temporary storage of solid wastes generated in the Borough. The site is located on the corner of Averne and Wildwood Avenues in the Borough. The facility accepts household solid waste generated in Ocean Gate. The site uses two crawler loaders to load 22-cy open top trailers for transfer of the wastes to the Southern Ocean Landfill, in Ocean Township, some 38 round-trip miles away.

The capacity of the transfer facility is 80 cy and, according to Department of Environmental Protection records, trash and rubbish are held at the site for up to 6 days and garbage is held a maximum of one day. The facility will not accept liquid, semi-liquid or septic waste.

FIG. IV-13 OCEAN GATE TRANSFER SITE.
VIEW LOOKING NORTHEAST.

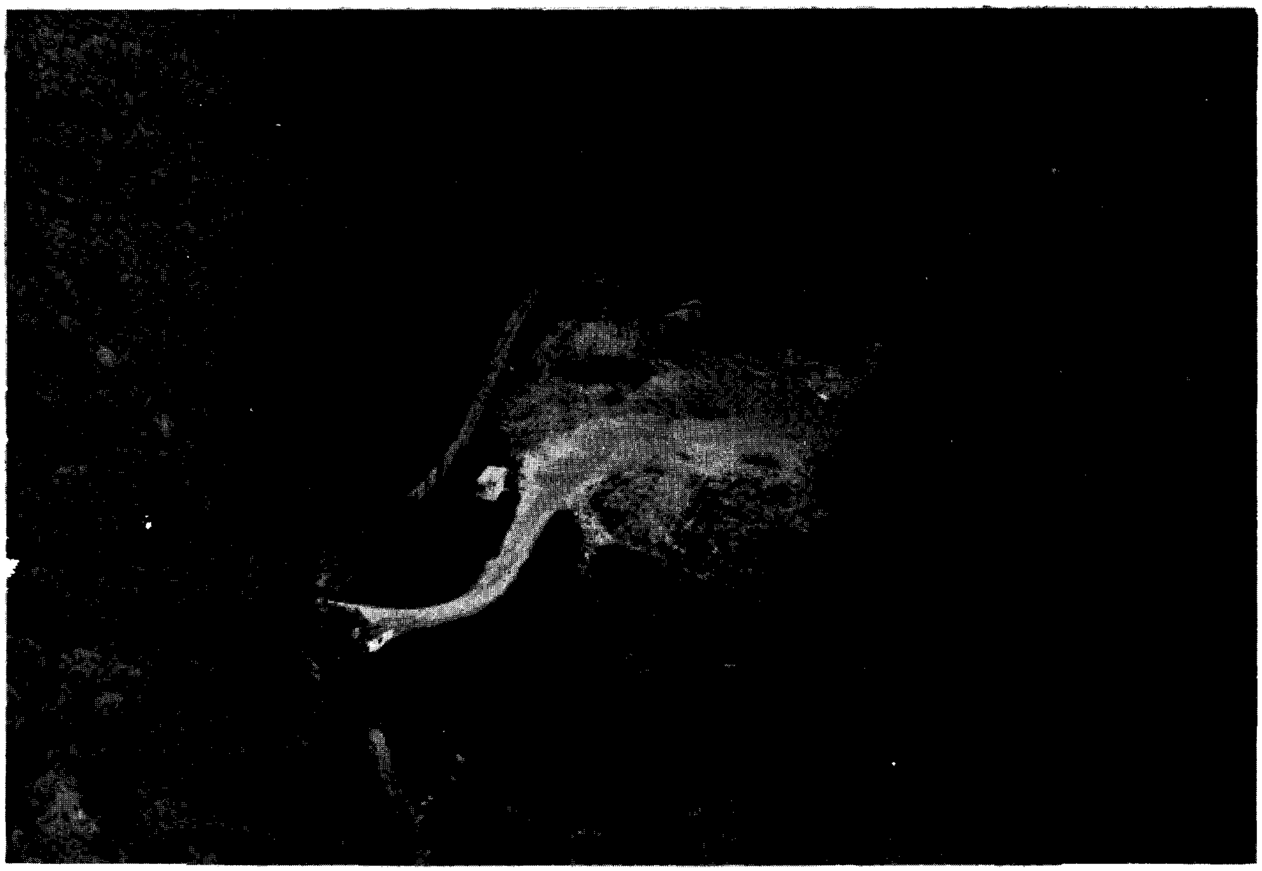


FIG. IV-14 PLUMSTED TOWNSHIP MUNICIPAL LANDFILL.
VIEW LOOKING SOUTHEAST.

According to municipal officials, the transfer of the solid waste achieves a mild compaction to a density of about 400 pounds per cubic yard per year. The Borough reportedly spent $5,500. in 1973 for disposal at the Southern Ocean Landfill.

PLUMSTED TOWNSHIP MUNICIPAL LANDFILL

Plumsted's municipal landfill is located on Lakewood Avenue in the Township. The disposal site has about 10 acres of land which is currently being landfilled by the trench method. The trench excavation provides sufficient cover material for the needs of the landfilling operation. The landfill uses an Allis Chalmers HD-6 front end loader. The volunteer fire department provides fire protection.

According to landfill records, about 10 of Plumsted's collection vehicles use the disposal site each week. The facility is restricted for Township use only. It is surrounded by woodlands. The site reportedly has a 20-year life expectancy.

SOUTH TOMS RIVER MUNICIPAL LANDFILL

South Toms River operates a municipal landfill for disposal of solid wastes generated within the Borough. The facility accepts household trash and garbage, leaves, branches, bulky clean-up items, and tree stumps. No liquid or semi-liquid septic or sewer wastes are accepted. According to landfill records, about 3 truck loads of solid waste enter the facility each day. The landfill is about 5.1 acres in size.

STAFFORD TOWNSHIP MUNICIPAL LANDFILL

Stafford operates a landfill on Recovery Road in the Township. The disposal site is 350 acres in area, of which 25.5 acres is presently being landfilled. The facility accepts all domestic, commercial and institutional solid wastes, yard debris, septic wastes, and sewage sludges.

The soil at the site includes various graded sands and gravels with isolated clay lenses. The groundwater varies between 12 feet and 52 feet below existing ground level. The groundcover on the area is scrub pines and oaks, but the landfill is clear of any growth.

The landfill currently uses the area method of landfilling. The site has sufficient and suitable cover material. An estimated 170 cy of cover is used daily.

Landfill equipment at the site includes an Allis-Chalmers 645 front end loader with a 3 cy bucket, an Allis-Chalmers HD-11 bulldozer, and a 23 cy scraper. Fire protection at the disposal site includes fire extinguishers on all operational

FIG. IV-15 SOUTH TOMS RIVER BOROUGH MUNICIPAL LANDFILL.
VIEW LOOKING SOUTHWEST.

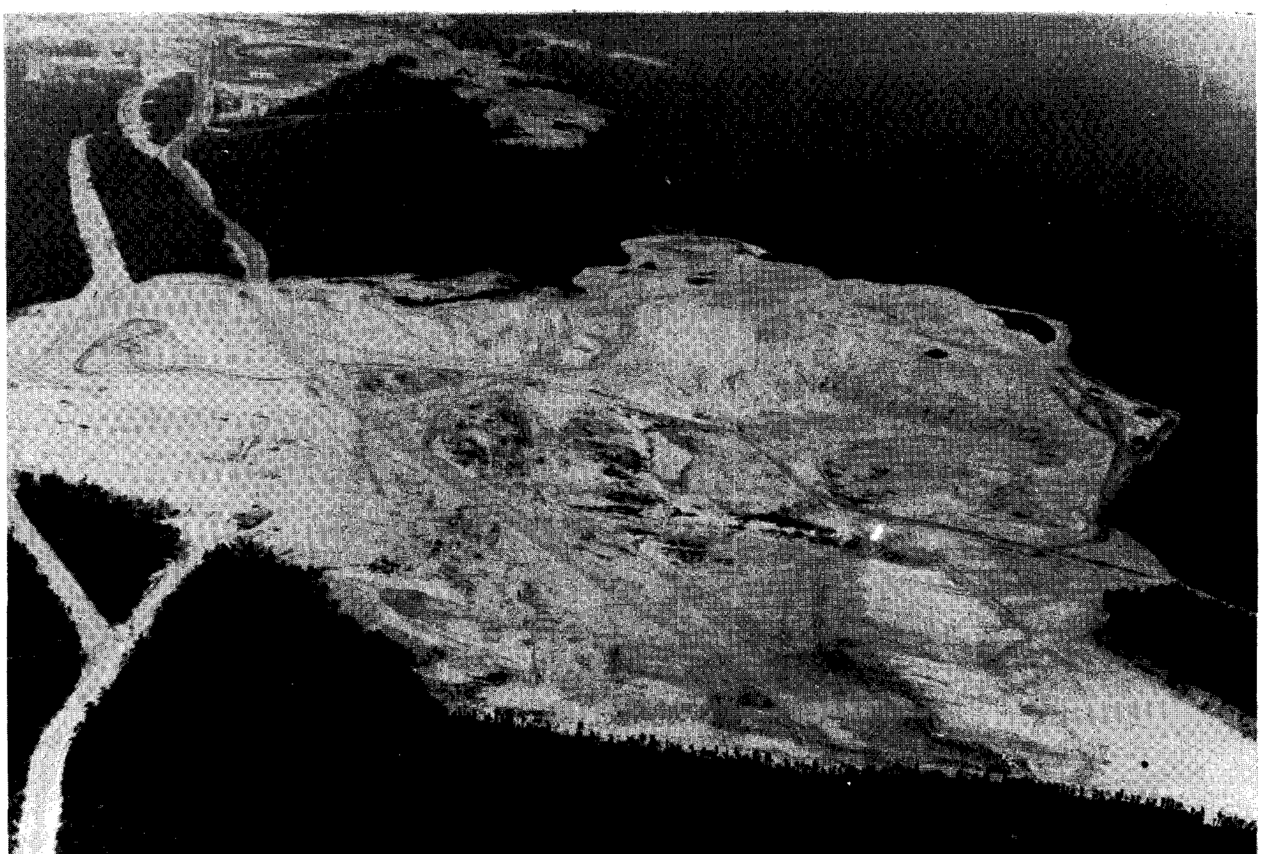


FIG. IV-16 STAFFORD TOWNSHIP MUNICIPAL LANDFILL.
VIEW LOOKING SOUTHEAST.

equipment and the use of cover material to smother any fires.

According to landfill records, 34 of Stafford's collection trucks enter the landfill each week. Approximately 100 trucks from other municipalities enter the disposal site each week.

Currently, the following municipalities haul their solid wastes to the Stafford Township Landfill: Long Beach Township, Stafford Township, and Surf City.

The design volumes for the landfill include the following maximum waste quantities:

| | |
|---|---|
| Garbage | 128,000 cy/yr. |
| Trash | 39,000 cy/yr. |
| Sludge | 1,000,000 gal. |
| Septic Tank Wastes | 1,200,000 gal. |

The total capacity of the landfill is 393,000 cy, and the estimated life of the facility, based on 568 cy per day of wastes accepted, is 2.2 years. Upon completion of the landfilling operation, the land, which is zoned rural, will be used as a green area and a recreation facility.

The Stafford Township Landfill uses the following fee schedule for commercial and private users who are registered with the Bureau of Solid Waste Management and with Stafford Township.

| | |
|---|---|
| Septic wastes | $6.00 per 1000 gallons of capacity of vehicle |
| Compacted materials | $1.20 per cubic yard of capacity of vehicle |
| Domestic garbage and rubbish (non-compacted and delivered in open-body vehicle | $1.00 per cubic yard |
| All other materials including refuse, building materials, trees, weeds, commercial or industrial garbage and rubbish, fill and tires | $1.10 per cubic yard |
| Minimum charge for use of site facilities | $8.00 per load |

All non-commercial users of the landfill who deposit refuse contained in passenger cars, station wagons, or trucks not exceeding 1/2 ton are not required to pay.

TUCKERTON-EAGLESWOOD MUNICIPAL LANDFILL

The Borough of Tuckerton and the Township of Eagleswood jointly operate a landfill located on Forge Road in West Creek, Eagleswood Township. The 27-acre landfill accepts household solid wastes, clean-up bulky items, branches, and septic tank wastes which are generated in either of the two municipalities.

The disposal facility currently uses the area method of landfilling. The landfill indicates that there is sufficient cover material on the site to meet the needs of the landfilling operation. The disposal site utilizes a John Deere 2 cy loader for application of cover material.

The landfill is open 24 hours per day from Monday through Friday. Landfill records indicate that approximately 20 collection trucks per week enter the disposal facility and use is limited to wastes generated in Tuckerton Borough and Eagleswood Township. Although the surrounding areas are zoned rural, the landfill has no zoning. The planned use for the site, upon completion of the landfill operation, is for recreational or light industrial use. The life expectancy of the site is reportedly 10 years.

FRANCIS TANNER TRUCKING COMPANY LANDFILL

The Tanner Trucking Company operates a landfill for the disposal of construction and demolition waste generated by the company. The 30-acre site is located on Gunning River Road, in Union Township. The landfill also accepts trees, stumps, concrete, leaves, branches, and fill from construction projects.

The soil on the site consists of coarse to medium sand with gravel and clay surface sand. The fill utilizes the area method of landfilling and has a 5 year expected life. According to company officials, there is sufficient cover material on the site to meet the needs of the landfilling operation.

The landfill utilizes a Caterpillar 966 C loader and a Caterpillar D-5 bulldozer for compaction and cover application. The landfill accepts about 150 Tanner Trucking Company's trucks per week.

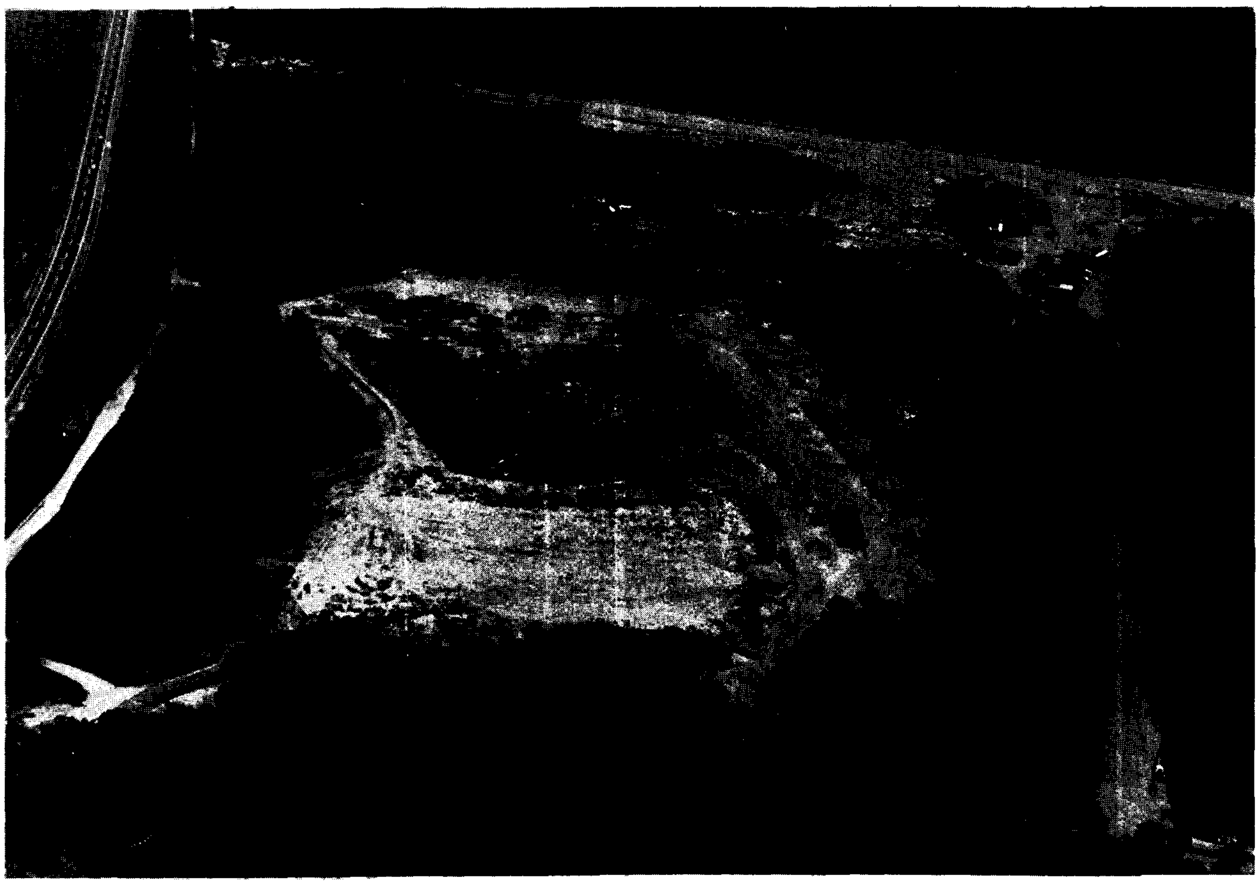


FIG. IV-17 TUCKERTON AND EAGLESWOOD MUNICIPAL LANDFILL.
VIEW LOOKING NORTHEAST.

FIG. IV-18 LONE PINE LANDFILL (PRIVATE)
LOCATED IN MONMOUTH COUNTY.

## JAMES H. JAMES, INC., LANDFILL

The private contracting firm of James H. James, Inc. of Brick Town maintains a private landfill for disposal of solid wastes including commercial, industrial, clean-up, branches, leaves, tires, etc. At the present time, the landfill is not accepting residential household waste.

The landfill, located on 21 acres of land at the end of School House Road in Brick Town, utilizes the area method of landfilling. The soil contains a mixture of coarse and fine sands with isolated lenses of clay. The groundcover varies from trees and scrub brush to sand. The water table is reportedly at least 53 feet below the surface. The site also contains sufficient and suitable cover material to meet the needs of the landfilling operation.

The equipment used on the landfill includes a Michigan 4-wheel drive 2 cy loader and a John Deere 1 cy backhoe. Fire protection is supplied by pumping from wells located on landfill property.

According to DEP records, 30 James H. James', Inc. trucks per week and 50 other private contractor's trucks use the facility.

The site is zoned residential. Currently, the following fee schedule is in effect at the landfill:

| Material | Rate |
|---|---|
| Bulky trash | |
| Pick-up truck | $ 4.00 per load |
| 4-16 cy truck | $10.00 per load |
| 10-14 cy truck | $20.00 per load |
| Tractor and trailer | $30.00 per load |
| Tires | $ 2.00 each tire |
| Over 20 tires | $ 5.00 each tire |
| Garbage | $ 1.50 per cy |

## LAKEHURST NAVAL AIR STATION LANDFILL

The Lakehurst Naval Air Station in Lakehurst operates a landfill on the base for the disposal of solid waste generated on the base. The 15-acre site utilizes the area method of landfilling. Equipment at the site includes a back-hoe, a crawler-dozer, and a front end loader. The site accepts approximately 250 tons per week of solid waste. The solid waste is collected throughout the base in containers and hauled to the fill for disposal. There is sufficient cover material on the site to meet the needs of the landfilling operation.

## LONE PINE CORPORATION LANDFILL

The Lone Pine Landfill located on Burke Road in Freehold Township, Monmouth County, accepts industrial waste from Dover Township. Generally, the landfill accepts household refuse, commercial, industrial, institutional, tires, dead animals, agricultural wastes, yard debris, sewage sludge, septic waste and bulky clean-up items. The disposal area is 144 acres. The area method of landfilling is used and there is sufficient cover material on the site to meet the needs of the landfilling operation. The disposal site utilizes two International Harvester 16-ton bulldozers and a Hough H-60 2 cy payloader. The landfill has a 2,000 gallon water tank which is used for fire protection.

Landfill records indicate that approximately 20 trucks owned by the Lone Pine Corporation and 168 independent contractor's trucks use the landfill each week. The site is zoned for landfill and the eventual end-use of the land will be for an industrial park. The disposal facility has a 19-year life expectancy.

According to information on file with the Public Utilities Commission, the following fee schedule is in effect:

| Material | Rate |
|---|---|
| Standard charge, garbage and refuse | $0.80 per cy |
| Lumber, stumps, demolition | $1.25 per cy |
| Car tires | $0.25 each |
| Truck tires | $2.50 each |
| Minimum charge | $1.50 |

## OCEAN COUNTY LANDFILL CORPORATION

The Ocean County Landfill Corporation operates a landfill on Route 70, 1/4 mile east of County Route 571, in Manchester Township. The landfill is privately owned and operated under Public Utilities Commission jurisdiction. It accepts solid and liquid wastes from the general public as well as munici-

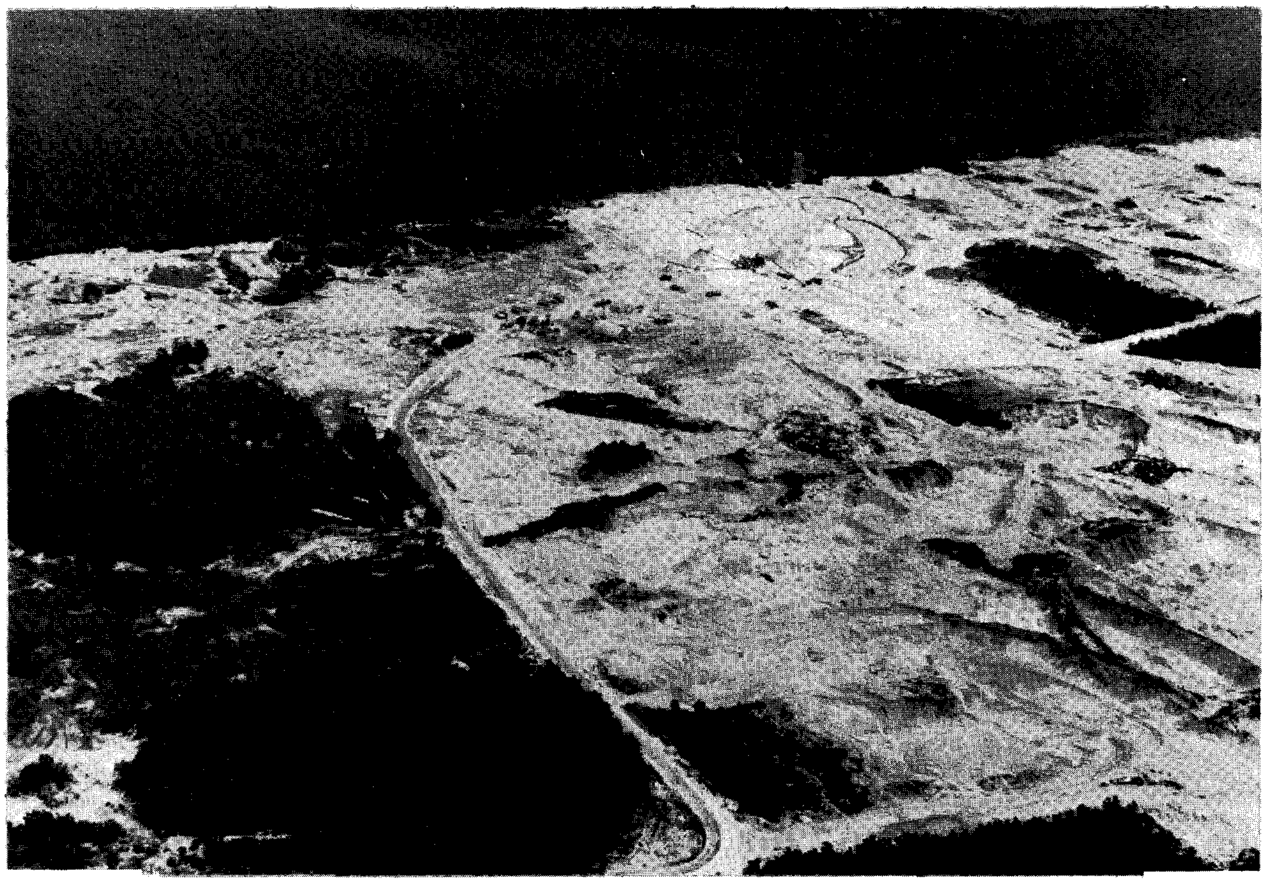


FIG. IV-19 OCEAN COUNTY LANDFILL CORPORATION (PRIVATE)
VIEW LOOKING SOUTHEAST.

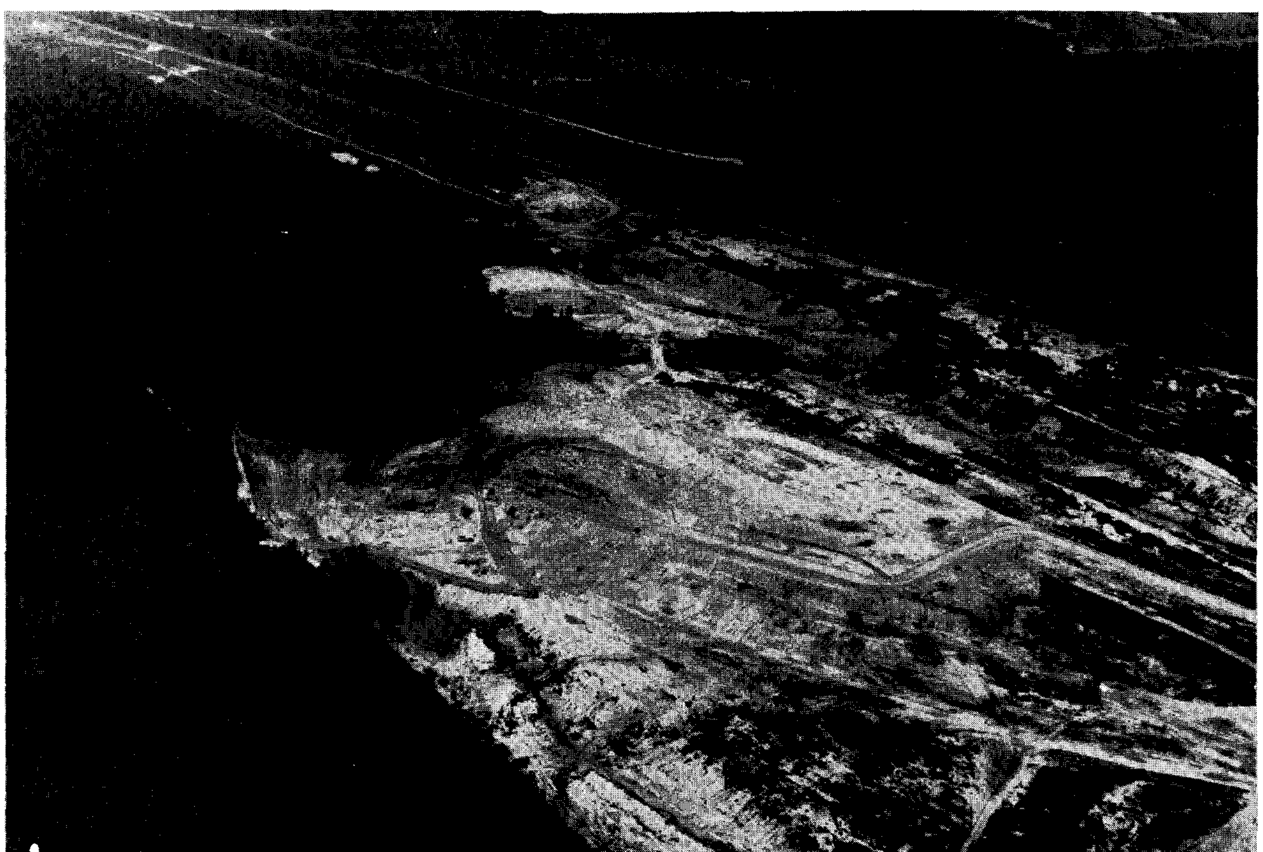


FIG. IV-20 SHREWSBURY DISPOSAL LANDFILL (PRIVATE)
LOCATED IN MONMOUTH COUNTY.

palities. The landfill currently uses the following fee schedule:

| Material | Rate |
|---|---|
| Residential refuse | $4.50 per ton |
| Single individual customer | $1.00 per 30 gallon container |
| Commercial refuse | $4.50 per ton |
| Bulky refuse | $4.50 per ton |
| Oversized refuse | $6.00 per ton |
| Demolition concrete | $3.00 per ton |
| Demolition wood | $6.00 per ton |
| Septic waste | $0.06 per gallon |

Wastes accepted at the disposal site include household garbage and trash, commercial, industrial, institutional, bulky clean-up items, septic wastes, sewage sludge, yard debris, etc. According to files of the Department of Environmental Protection, the landfill is 400 acres in size.

The soil at the disposal site is gravel, sand, and clay to a depth of 75 feet. The groundcover is top soil and road gravel. The facility uses the trench and area methods of landfilling. Cover material is available on site from excavation at a sand mine. The landfill reportedly uses 250 cy of cover daily.

According to municipal officials, the following municipalities have solid waste hauled to the Ocean County Landfill Corporation disposal site: parts of Manchester Township, Lavallette Borough, Seaside Heights Borough, as well as private contractors servicing commercial and industrial units throughout northern Ocean County.

Equipment utilized on the landfill include a Bucyrus Erie 61-B 3½ cy drag line, a Caterpillar D-8 bulldozer, a Caterpillar D-6 bulldozer, a Caterpillar 980 front end loader, a Caterpillar 12F motor grader and three Caterpillar 35 ton rear dump trucks.

## OCEAN COUNTY SEWERAGE AUTHORITY SLUDGE DISPOSAL SITES

The Ocean County Sewerage Authority, in cooperation with Rutgers University, is currently experimenting with land disposal of sludge at two locations in Ocean County. The Greenwood Forest Fish and Wildlife Management Area in Lacey

Township and the Colliers Mills Fish and Wildlife Management Areas in Plumsted Township each have four 10,000 square foot test plots. The first plot will act as a control and the remaining three will receive loadings of 10, 20, and 40 tons per acre. The sludge will be mixed into the soil and crops planted during the growing season.

Each site will have a minimum of 30 wells monitoring groundwater. United States Geological Survey personel as well as Rutgers University will monitor the wells and check water samples for a minimum of 50 contaminants.

OLSON SEPTIC SERVICE LANDFILL

Olson Septic Service of Toms River operates a sanitary landfill on Lacey Road in Lacey Township for disposal of septic wastes. The 100-acre fill has a planned life expectancy of 5-10 years. The fill utilizes a large farm tractor, road grader, and a small bulldozer.

According to company officials, the fill accepts septic wastes from the following municipalities: Beachwood, Berkeley, Dover, Lacey, Ocean Gate and Pine Beach. Approximately 25 Olson Septic Service's collection trucks enter the fill weekly.

SHREWSBURY DISPOSAL COMPANY LANDFILL

Currently, wastes from the Borough of Mantoloking are hauled to the Shrewsbury Disposal Company on Asbury Avenue in Colt's Neck Township, Monmouth County. The disposal site is privately owned and accepts wastes, including household, commercial, industrial, institutional, agricultural, yard debris and bulky clean-up items, for disposal from 15 municipalities.

According to New Jersey Department of Environmental Protection files, the landfill's area is 131$\pm$ acres. The soils consist of silty fine sands and the groundcover is partially wooded. The groundwater is reportedly from 8 inches to 4 feet deep and there is occasional surface ponding of water.

The facility uses the area method of landfill. According to landfill sources, there is sufficient and suitable cover on site to meet the needs of the operation. The facility reportedly uses between 200 and 300 cy of cover daily. Equipment at the site includes a Caterpillar D-8 bulldozer, a Michigan 210 earth mover, a crawler pan and a back hoe. The dozer and portable pumps are used for fire protection purposes.

According to Public Utility Commission tariffs, the following fee schedule is used at the fill:

| Material | Rate |
|---|---|
| Bulky refuse | $1.50 per cy |
| All other disposal | $1.00 per cy |
| Minimum charge | $5.00 |

Reportedly, approximately 450 trucks per week enter the facility. Its operating hours are 6 AM to 6 PM, Monday through Saturday.

The disposal site area is zoned for industrial purposes.

SOUTHERN OCEAN LANDFILL, INC.

Southern Ocean Landfill, Inc., site is located on Route 532 in Ocean Township. The 283-acre facility reportedly accepts all wastes, including household, commercial, industrial, institutional, bulky items, tires, yard debris, sewage sludge, and septic tank wastes. The landfill is open to the public.

The soil at the site is predominantly sand with some layers of clay and sand-clay. The groundcover is wooded. The landfill utilizes the area and trench methods of landfilling. There is reportedly sufficient cover material on site to meet the needs of the landfill. The landfill uses a Caterpillar 977-H front end loader, and a Caterpillar D-7 bulldozer.

According to landfill records, trucks from the firm of Calderia Brothers make about 25 trips to the disposal area per week. In addition, solid wastes from the following municipalities enter Southern Ocean Landfill, Inc.: Beach Haven, Barnegat Light, Harvey Cedars, Island Heights, Ocean Township, Ocean Gate, Pine Beach, Ship Bottom, and Union Township.

According to Public Utilities Commission tariffs, Southern Ocean Landfill Inc., uses the following fee schedule:

| Material | Rate |
|---|---|
| Bulky refuse | $2.50 per cy or $6.00 per ton, whichever is greater |
| Loose and/or compacted | $1.00 per cy or $3.00 per ton, whichever is greater |
| Chemicals | $0.05 per gallon |
| Septic Waste 1000-2000 gallons | $5.00 per 1000 gallons |
| 2100 or greater | $8.50 per 1000 gallons |

FIG. IV-21 SOUTHERN OCEAN LANDFILL CORPORATION (PRIVATE)
VIEW LOOKING SOUTHEAST.

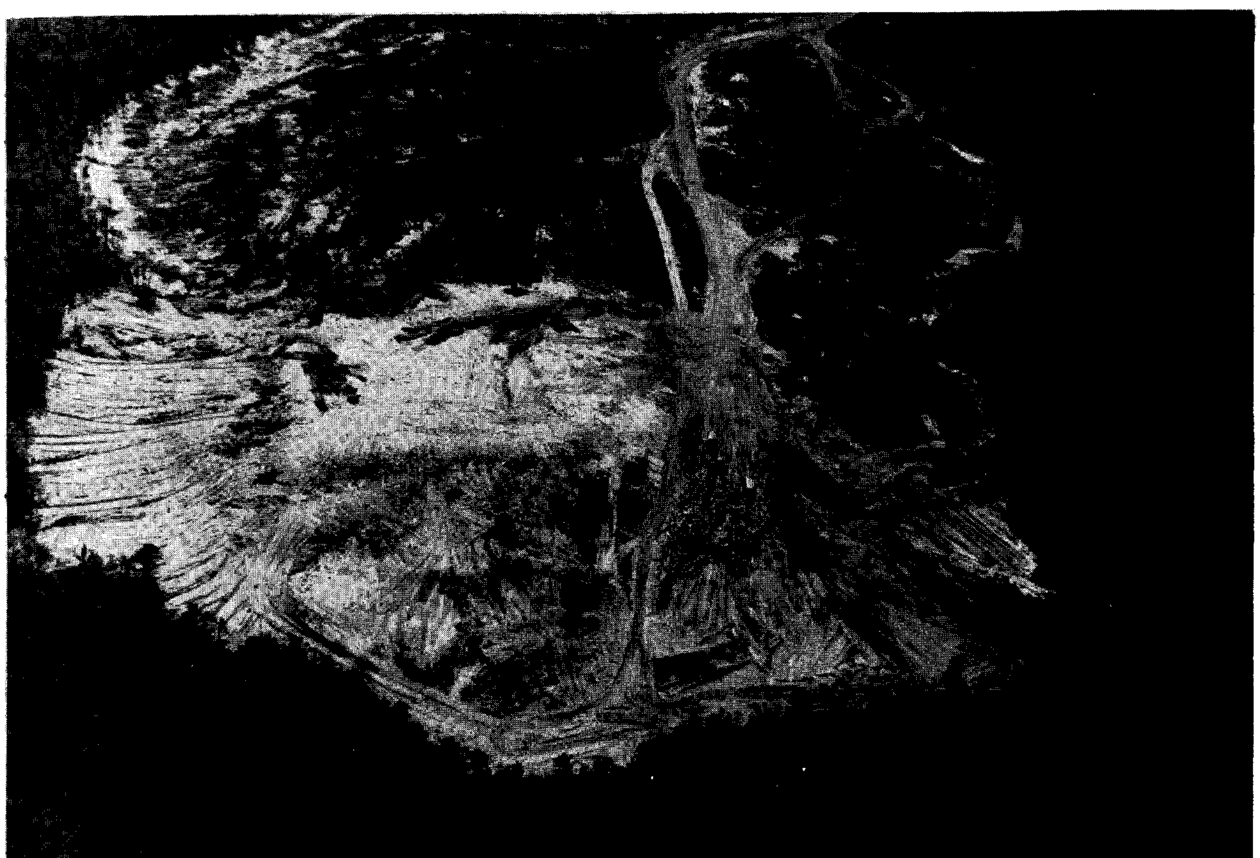


FIG. IV-22 WASTE DISPOSAL INC. LANDFILL (PRIVATE)
LOCATED IN MONMOUTH COUNTY.

## TOMS RIVER CHEMICAL CORPORATION LANDFILL

The Toms River Chemical Corporation of Dover Township utilizes a landfill on plant property for disposal of non-hazardous, insoluble, solid chemical wastes. The 2.1± acres landfill uses an area method of landfilling. According to company officials, there is sufficient cover material on plant property to meet the needs of the landfilling operation. The company utilizes a Caterpillar front end loader, and a Caterpillar bulldozer for volume reduction, and cover application. The landfill has a 4 year life expectancy.

In addition, the company has a 2 acre emergency trash landfill that is used if the stationary compactor breaks down. The compactor loads containers that are serviced by a private contractor.

## WASTE DISPOSAL, INC., LANDFILL

Currently, solid wastes from Point Pleasant and Point Pleasant Beach are hauled to the Waste Disposal, Inc. facility on Lakewood-Allenwood Road in Neptune, Monmouth County. The 250-acre facility accepts all types of household, commercial, industrial, institutional, and agricultural solid wastes, sewage and septic wastes, as well as junked automobiles and chemicals. The facility is privately owned and accepts waste from nine Monmouth County municipalities as well as private contractors servicing Ocean and Monmouth Counties.

The facility utilizes the area method of landfilling. There is sufficient cover material on site to meet the estimated 100 cy of cover material needed daily. The original ground topography is reportedly at elevation 44 and the water table is at elevation 37. The equipment used at the site includes a pan scraper and a Caterpillar D-6 bulldozer.

According to DEP files, more than 310 trucks enter the facility each week. The hours of the operation are 6 AM to 9 PM daily.

According to Public Utility Commission tariffs, the landfill charges the following fees:

| Material | Rate |
|---|---|
| General garbage | \$0.75 to \$1.00 per cy |
| Mixed garbage, including wood | \$1.00 to \$1.25 per cy |
| Large wood pieces or other heavy metal | \$1.50 to \$2.00 per cy |

The planned use of the disposal site upon completion of the landfilling operation is for a heavy industrial site.

## 1974 RESIDENTIAL AND MUNICIPAL SOLID WASTE MANAGEMENT COSTS IN OCEAN COUNTY

As previously mentioned, Ocean County utilizes three solid waste collection systems: municipal, contract and private. The costs for these systems vary depending on the level of service (i.e., backyard or curb pickup), the quantity of waste collected, and the frequency of collection. Generally, the systems are similar in overall cost if they provide comparable services.

The municipal collection system utilizes municipal equipment and manpower for solid waste collection and disposal. Typically, the costs for the services come out of the annual municipal budget. Under this system, the municipality is responsible for all collection and disposal services. The residents pay for the services through municipal taxes.

A municipally-contracted system utilizes one or more private contractors to serve the collection and disposal needs of the units specified in the contract. The contractor collects all residential wastes and usually services the small commercial firms as well. The specifications for the service (such as frequency, clean-up, etc.) are all included in the contract. The annual contract price is clearly indicated. Contracts generally run from 1 to 5 years in length. In this type of collection system, the municipality's involvement in the process is limited to preparing the contract specifications, paying the contractor, and some minor degree of contract overview.

Private collection involves private contractors who deal with the residents directly. The contractor provides the level of service requested by the homeowner, tenant, or landlord, and fixes the monthly or quarterly price accordingly. With this system, the municipality generally remains out of the solid waste collection process. However, the three municipalities that do use this system, Jackson, Manchester, and Plumsted, provide disposal facilities that are open for use by the various contractors as well as residents who may choose to haul their own refuse.

There are many variations to these three basic systems, and no two municipalities are exactly alike. Caution must be exercised when comparing costs between municipalities when the level of service is different. For example, a municipality may have an annual estimated cost per household of $40.00. However, the municipality may only provide twice-weekly curbside pick-up with no clean-up week. Another municipality may have an annual per household cost of $60.00, but this municipality may provide 3 backyard collections per week and have 2 clean-up weeks per year.

Twenty-two Ocean County municipalities utilize a municipal collection system. Typically, municipal solid waste management expenditures are listed under the general heading, "Garbage and Trash Disposal" and subdivided into "salaries and wages" and "other expenses". While direct manpower expenses are generally included under "salaries and wages", salaries of administrative personnel and manpower loaned from other departments during peak periods are generally not included. Also, fringe benefits, such as workmen's compensation, retirement, and insurance premiums are grouped together under expenditures of the Department of Finance. "Other expenses" generally include expenditures for equipment, uniforms, contracted collection costs, and maintenance. In determining the costs of municipal collection systems, the budgeted appropriations for "garbage and trash disposal" were increased to include those items such as fringe benefits and depreciation which were not included under the solid waste appropriation.

Eight Ocean County municipalities have a municipal contractor for the collection and disposal of the solid wastes generated. Three municipalities have private contractors who contract with individual residents.

Table IV-6 presents a summary of municipal solid waste expenditures for each municipality. Table IV-7 presents a summary of costs for solid waste collection on a per capita basis.

## RESIDENTIAL SOLID WASTE QUANTITIES

The evaluation of current solid waste collection rates in the 33 municipalities of Ocean County is a difficult and complex task. Most municipal and private collection systems

TABLE IV-6

SUMMARY OF DIRECT MUNICIPAL EXPENDITURES FOR SOLID WASTE COLLECTION AND DISPOSAL 1975

| MUNICIPALITY | COLLECTION SYSTEM | DIRECT MUNICIPAL EXPENDITURES* | COMMENT |
|---|---|---|---|
| BARNEGAT LIGHT | Contract | $ 32,331 | |
| BAY HEAD | Contract | 62,667 | |
| BEACH HAVEN | Municipal | 87,950 | |
| BEACHWOOD | Municipal | 95,554 | |
| BEREKLEY | Municipal | 132,830 | |
| BRICK | Municipal | 879,137 | |
| | | 17,140 | Recycling |
| | | 33,606 | Seaweed disposal |
| | | 32,246 | Leaf disposal |
| | Total | 962,129 | |
| DOVER | Municipal | 590,000 | |
| EAGLESWOOD | Municipal | 15,000 | |
| HARVEY CEDARS | Contract | 29,377 | |
| ISLAND HEIGHTS | Municipal | 23,926 | |
| JACKSON | Private | 340,871 | |
| LACEY | Municipal | 144,500 | |
| LAKEHURST | Municipal | 27,000 | |
| LAKEWOOD | Municipal | 78,600 | |
| | | 10,000 | Leaf disposal |
| | | 20,000 | Road sweepings |
| | Total | 108,600 | |
| LAVALLETTE | Municipal | 72,500 | |
| LITTLE EGG HARBOR | Municipal | 127,000 | |

TABLE IV-6, CONTINUED

SUMMARY OF DIRECT MUNICIPAL EXPENDITURES
FOR SOLID WASTE COLLECTION AND DISPOSAL 1975

| MUNICIPALITY | COLLECTION SYSTEM | DIRECT MUNICIPAL EXPENDITURES* | COMMENT |
|---|---|---|---|
| LONG BEACH | Contract | $149,900 | |
| | | 15,000 | Sand disposal |
| | Total | 164,900 | |
| MANCHESTER | Private | 289,274 | |
| MANTOLOKING | Contract | 35,233 | |
| OCEAN | Contract | 48,725 | |
| OCEAN GATE | Municipal | 24,500 | |
| PINE BEACH | Municipal | 20,996 | |
| PLUMSTED | Private | 57,990 | |
| PT. PLEASANT | Contract | 275,868 (average) | |
| PT. PLEASANT BEACH | Municipal | 83,150 | |
| SEASIDE HEIGHTS | Municipal | 91,000 | |
| SEASIDE PARK | Municipal | 72,300 | |
| SHIP BOTTOM | Municipal | 51,800 | |
| SO. TOMS RIVER | Municipal | 31,305 | |
| STAFFORD | Municipal | 181,000 | |
| SURF CITY | Municipal | 48,900 | |
| TUCKERTON | Municipal | 49,000 | |
| UNION | Contract | 66,500 | |

*Clean-up activities included in reported costs. Frequently reported municipal costs are understated because of hidden labor, administration, fringe benefits, etc.

TABLE IV-7

1975 COSTS FOR RESIDENTIAL SOLID WASTE COLLECTION AND DISPOSAL

| MUNICIPALITY | COLLECTION FREQUENCY/WEEK | | REPORTED COST BASIS | | ESTIMATED YEARLY COST PER CAPITA* |
|---|---|---|---|---|---|
| BARNEGAT LIGHT | Curb | 2 | Contract | $ 32,331 | $14.49 |
| BAY HEAD | Backyard | 3 | Contract | 62,667 | 30.81 |
| BEACH HAVEN | Backyard | 3 | Municipal | 87,950 | 12.40 |
| BEACHWOOD | Curb | 2 | Municipal | 95,554 | 17.67 |
| BERKELEY | Curb | 2 | Municipal | 132,830 | 10.54 |
| BRICK | Curb | 2 | Municipal | 962,129 | 18.66 |
| DOVER | Curb | 2 | Municipal | 590,000 | 11.30 |
| EAGLESWOOD | Curb | 2 | Municipal | 15,000 | 16.91 |
| HARVEY CEDARS | Curb | 2 | Contract | 29,377 | 16.79 |
| ISLAND HEIGHTS | Curb | 3 July-Aug.<br>2 Balance | Municipal | 23,926 | 13.90 |
| JACKSON | Curb | 2 | Private | 340,871 | 15.25 |
| LACEY | Curb | 2 | Municipal | 144,500 | 12.17 |
| LAKEHURST | Curb | 2 | Municipal | 27,000 | 9.22 |
| LAKEWOOD | Curb | 2 | Municipal | 108,600 | 3.34** |
| LAVALLETTE | Curb | 3 Summer<br>2 Winter | Municipal | 72,500 | 13.23 |
| LITTLE EGG HARBOR | Curb | 2 | Municipal | 127,000 | 17.32 |
| LONG BEACH | Curb | 2 | Contract | 164,900 | 14.22 |
| MANCHESTER | Curb | 2 | Private | 289,274 | 20.63 |
| MANTOLOKING | Backyard | 3 Summer<br>2 Winter | Contract | 35,233 | 55.14 |
| OCEAN | Curb | 2 | Contract | 48,725 | 14.69 |
| OCEAN GATE | Curb | 3 Summer<br>2 Winter | Municipal | 24,500 | 17.74 |
| PINE BEACH | Curb | 2 | Municipal | 20,996 | 12.53 |

TABLE IV-7, CONTINUED

1975 COSTS FOR RESIDENTIAL
SOLID WASTE COLLECTION AND DISPOSAL

| MUNICIPALITY | COLLECTION FREQUENCY/WEEK | | REPORTED COST BASIS | | ESTIMATED YEARLY COST PER CAPITA* |
|---|---|---|---|---|---|
| PLUMSTED | Curb | 1 | Private | $ 57,990 | $12.82 |
| POINT PLEASANT | Curb | 3 Summer<br>2 Winter | Contract | 275,868 | 15.04 |
| POINT PLEASANT BEACH | Curb | 3 Summer<br>2 Winter | Municipal | 83,150 | 7.75 |
| SEASIDE HEIGHTS | Curb | 7 Summer<br>3 Winter | Municipal | 91,000 | 11.33 |
| SEASIDE PARK | Backyard | 3 June-Sept.<br>2 Balance | Municipal | 72,300 | 10.35 |
| SHIP BOTTOM | Curb | 3 Summer<br>2 Winter | Municipal | 51,800 | 12.82 |
| SOUTH TOMS RIVER | Curb | 2 | Municipal | 31,305 | 7.14 |
| STAFFORD | Curb | 2 | Municipal | 181,000 | 31.06 |
| SURF CITY | Curb | 2 | Municipal | 48,900 | 14.65 |
| TUCKERTON | Curb | 2 | Municipal | 49,000 | 17.09 |
| UNION | Curb | 2 | Contract | 66,500 | 13.48 |
| COUNTY | | | | $4,444,676 | $13.61 |

*Estimate cost per capita is based on average equivalent all year and summer populations.

**Lakewood's disposal costs are offset substantially by income from its landfill.

have limited records concerning solid waste quantities, truck loads, solid waste density in terms of pounds per cubic yard, etc.

There is a tendency to overestimate quantities of solid waste collected. Solid waste collections vary because of seasonal or holiday influences. Hence peak solid waste quantities can be considerably larger than average quantities, especially in the shore communities which serve large numbers of vacationers. In many cases, this peaking of solid waste collections is remembered and reported as the normal or average quantity.

Evaluation of accurate per capita collection rates is a complex matter because of varying collection practices from community to community. There are several categories which are considered in each municipality's domestic figure:

1. Household garbage and solid wastes.
2. Yard clippings and debris including grass and some leaves.
3. Clean-up items, including bulky white goods.
4. Small commercial, small mercantile and small industrial establishments with perhaps two or three refuse cans per collection.
5. Special refuse items such as sand, seaweed, shells, etc., which are unique to the shore area.

Some communities include and report all solid waste quantities from each of the category items in their collection figures.

Others include and report only partial quantities from each item. Difficulty develops in comparing per capita production rates in communities that do not provide the same type of service. Per capita production rates should not be directly compared unless careful study is made between the various solid waste collection systems, the respective refuse collection ordinances, and the type of ancillary service provided by the municipality.

The estimated residential collection quantities of solid wastes from the 33 municipalities have been tabulated in Table IV-8. The figures in Table IV-8 should be considered as estimates only, with an accuracy of 10 to 15 percent, plus or minus. They are, however, the best figures currently available on the County production of domestic solid wastes. The values were obtained from municipal officials, contractors, engineering computations, and all available records from the New Jersey Department of Environmental Protection and the Public Utilities Commission. The average per capita rate of production in Ocean County is 4.9 pounds per day per capita, and the annual tonnage is about 292,500 tons per year or about 800 tons per day on the average.

## COMMERCIAL AND INDUSTRIAL SOLID WASTE COLLECTION AND DISPOSAL PRACTICES IN OCEAN COUNTY

In contrast to patterns developed elsewhere in New Jersey, a large majority of Ocean County's industrial and commercial

TABLE IV-8

1974-1975 ESTIMATES OF RESIDENTIAL SOLID WASTE COLLECTED

| MUNICIPALITY | ESTIMATED AVERAGE POUNDS PER CAPITA PER DAY* | ESTIMATED YEARLY TONNAGE* |
|---|---|---|
| BARNEGAT LIGHT | 5.5 | 2,234 |
| BAY HEAD | 4.4 | 1,629 |
| BEACH HAVEN | 4.4 | 5,681 |
| BEACHWOOD | 6.6 | 6,495 |
| BERKELEY | 5.4 | 12,386 |
| BRICK | 6.0 | 56,309 |
| DOVER | 5.1 | 48,459 |
| EAGLESWOOD | 5.0 | 807 |
| HARVEY CEDARS | 4.5 | 1,433 |
| ISLAND HEIGHTS | 4.5 | 1,410 |
| JACKSON | 4.5 | 18,301 |
| LACEY | 5.7 | 12,319 |
| LAKEHURST | 3.2 | 1,706 |
| LAKEWOOD | 4.5 | 26,659 |
| LAVALLETTE | 4.7 | 4,687 |
| LITTLE EGG HARBOR | 3.5 | 4,672 |
| LONG BEACH | 4.5 | 9,499 |
| MANCHESTER | 4.0 | 10,207 |
| MANTOLOKING | 4.4 | 512 |
| OCEAN | 5.5 | 3,321 |
| OCEAN GATE | 4.6 | 1,156 |
| PINE BEACH | 6.0 | 1,830 |
| PLUMSTED | 5.5 | 4,530 |
| POINT PLEASANT | 4.0 | 13,355 |
| POINT PLEASANT BEACH | 4.5 | 8,784 |
| SEASIDE HEIGHTS | 3.9 | 5,703 |
| SEASIDE PARK | 4.2 | 5,339 |
| SHIP BOTTOM | 5.3 | 3,899 |
| SOUTH TOMS RIVER | 4.5 | 3,592 |
| STAFFORD | 4.4 | 4,666 |
| SURF CITY | 5.6 | 3,402 |
| TUCKERTON | 5.5 | 2,871 |
| UNION | 5.0 | 4,490 |
| COUNTY | 4.9 | 292,543 |

or about 800 tons per day

*Estimated solid waste quantities include household wastes, yard debris, some leaves, bulky goods and clean-up items, and some small commercial and mercantile establishments collected in regular pick-up. Estimates are ± 10% to 15%. Estimates are adjusted for seasonal populations.

firms do not rely on a private contractor for disposal of solid wastes. M. Disko Associates made a study of industrial and commercial collection and disposal in Ocean County in 1974. Based on 107 industrial and commercial firms which supplied data used in the study, 35 firms or 32.7% used the services of a private contractor for solid waste disposal; 33 firms or 30.8% had their wastes collected by the municipality, and 26 firms or 24.3% hauled the wastes to disposal sites themselves. The remaining 12.2% used a combination of methods as listed in Table IV-9. Since many municipalities have landfills, many firms find it economically advantageous to haul their own solid wastes using their own equipment and manpower because travel times and distances to the landfills are relatively short.

All commercial and industrial firms employing a private contractor for solid waste collection services contract directly with the collection firm. The costs incurred to the commercial or industrial establishment depend on the level of service, the quantities of solid waste, and the frequency of collection. Many small commercial firms, and an occasional small industrial plant, are serviced by the municipality's collection system. The frequency and level of service varies with the size of the firm (i.e., number of employees) and the type of manufacturing or non-manufacturing process. For example, as mentioned in Chapter III, large commercial or industrial firms may use a stationary compactor and a closed-

TABLE IV-9

INDUSTRIAL AND COMMERCIAL COLLECTION PRACTICES IN OCEAN COUNTY

| SOLID WASTE COLLECTED BY | COMMERCIAL AND INDUSTRIAL FIRMS RECEIVING COLLECTION NUMBER | PRECENT |
|---|---|---|
| PRIVATE CONTRACTOR | 35 | 32.7 |
| MUNICIPAL COLLECTION | 33 | 30.8 |
| DISPOSAL BY OWNER | 26 | 24.3 |
| PARTIALLY OWN MANPOWER AND PARTIALLY PRIVATE CONTRACTOR | 6 | 5.6 |
| PARTIALLY MUNICIPAL SYSTEM AND PARTIALLY OWN MANPOWER | 5 | 4.7 |
| PARTIALLY MUNICIPAL SYSTEM AND PARTIALLY PRIVATE CONTRACTOR | 2 | 1.9 |
| TOTAL | 107 | 100% |

* Data from a survey of 351 industrial and commercial firms in Ocean County. Above table is based on 107 fully completed questionnaires. Survey conducted in 1974.

top, roll-off container ranging in size from about 20 to 40 cubic yards. The container is detached from the compactor and hauled to a landfill for emptying. Many moderate sized firms use the open-top, roll-off containers ranging in size from about 10 to 40 cubic yards. These containers are serviced on a regular basis by a private contractor.

Small firms may utilize small open-top containers that are emptied into a regular collection compactor truck. In most cases, the containers are leased or rented from the contractor. Commercial and industrial firms are generally serviced two to six times per week. However, restaurants and food processing or packaging plants, which may generate large amounts of food waste, may be serviced daily.

As illustrated in Table IV-10, the majority of the industrial solid waste and almost all of the commercial solid wastes are hauled to a sanitary landfill for disposal. In addition, 7.9 percent of the industrial waste is incinerated and 6.9 percent is salvaged.

When M. Disko Associates contacted the industrial and commercial firms in Ocean County, comments were solicited concerning ideas for solid waste management in Ocean County. Some of the comments have been compiled in Table IV-11.

Based on the industrial and commercial survey, the 1974 costs

TABLE IV-10

PROCESSING AND DISPOSAL METHODS UTILIZED FOR DISPOSAL OF INDUSTRIAL AND COMMERCIAL SOLID WASTES GENERATED IN OCEAN COUNTY

| DISPOSAL METHOD | PERCENT INDUSTRIAL WASTE DISPOSED | PERCENT COMMERCIAL WASTE DISPOSED |
|---|---|---|
| SANITARY LANDFILL | 83.2 | 99.9 |
| OPEN DUMP | 1.9 | 0 |
| CHEMICAL CONVERSION | 0.1 | 0 |
| INCINERATION | 7.9 | 0 |
| SALVAGE | 6.9 | 0.1 |
| OTHER | 0 | 0 |
| TOTAL | 100% | 100% |

* Data based on industrial-commercial questionnaire distributed to Ocean County industries, 1974.

TABLE IV-11

COMMENTS MADE BY CORPORATE MANAGERS IN OCEAN COUNTY CONCERNING THE FUTURE OF SOLID WASTE MANAGEMENT

- Feasibility of recycling plant which operates with many different systems for recovery of everything including precious metals, trace elements, etc., in addition to paper, glass, rubber, and the usual metals and plastics should be considered. In lieu of above method, county-wide properly operated and controlled sanitary landfill systems seems to be a practical short term answer in Ocean County to future open green acres such as parks and golf courses.

- County should control collections which would be made segragated (paper, glass, metal, and garbage). This is further separated at the County Reclamation Center. Sewer sludge can be treated to form a completely organic fertilizer. Everything should be completely recycled. In the past year, the small group of people (approximately 15) have recycled over 3 tons of glass, the proceeds of which were donated to the Jackson School System for art supplies. With this amount of recycling done by just 15 people, imagine how the whole County could do.

- Recycling of paper and cardboard with one truck per route just collecting paper and cardboard. Am sure store owners would cooperate to see that just paper and cardboard was put out.

- County needs several centrally located solid waste disposal landfill sites, especially for tree stumps, and other debris that is connected to excavating and clearing of building lots.

- Regional incineration.

- Possibly community free pick-ups of specific recyclable materials where in volume might be sufficient to cover cost of service if delivered to waste dealers for reuse - would ease landfill problems at least.

- Methods used by large cities and other municipalities should be constantly studied. St. Louis has its generating plant burning waste with coal. Other cities are also developing ways and means. They should all be studied, then we should set our goals using the best method available.

- Regional Center for all waste which could be recycled - material pick-up in plant by civic group - profits go to that group.

TABLE IV-11, CONTINUED

COMMENTS MADE BY CORPORATE MANAGERS IN OCEAN COUNTY CONCERNING THE FUTURE OF SOLID WASTE MANAGEMENT

- Regional county collection, allow stores that separate cardboard and paper a discount on collection.
- By use of hammermill, this waste could be turned into a saleable product such as fire logs, possibly chip board.
- Due to the rising cost of business, waste paper, which is not recycled, is a very high cost factor and the recycling of that paper would not only save money but would aid in environmental protection.
- Recycle.
- Use of wastes as fuel for generating electricity.
- Recycling. Most commercial premises waste is paper.
- Possible use as a fuel for power plants.
- Lumber and paper should be burned instead of being buried. This would allow more space for other types of waste material.

for industrially-generated solid waste collection and disposal were $14.17 per ton. The costs for commercial solid waste collection and disposal were $11.47 per ton. Average costs for collection and disposal of all commercial and industrial solid wastes were $13.85 per ton.

COMMERCIAL AND INDUSTRIAL SOLID WASTE QUANTITIES

Commercial and industrial solid waste generation factors were obtained by inputing the 107 completed commercial and industrial firm surveys into a computer program that computed and compiled the generation rates. The 107 firms represent a cross-section of industrial manufacturers, banks, offices, restaurants, service establishments, etc., and represent about 14 percent of all county employment.

Total industrial and commercial employment in the County is shown in Table IV-12. The data was obtained from the New Jersey Department of Labor and Industry. The totals exclude government workers (local, county, state and federal), railroads, some banks, and self-employed workers.

Based on 107 fully completed survey questionnaires, Table IV-13 presents a summary of employees and solid waste quantities as reported for the 33 Ocean County municipalities. Municipalities with no waste quantities either have no commercial or industrial employees or the firms in the municipality did

TABLE IV-12

## 1973 ESTIMATED COMMERCIAL AND INDUSTRIAL EMPLOYEES IN OCEAN COUNTY

| MUNICIPALITY | COMMERCIAL EMPLOYEES | INDUSTRIAL EMPLOYEES | TOTAL EMPLOYEES |
|---|---|---|---|
| BARNEGAT LIGHT | 145 | 57 | 202 |
| BAY HEAD | 223 | 35 | 258 |
| BEACH HAVEN | 834 | 116 | 950 |
| BEACHWOOD | 273 | 251 | 524 |
| BERKELEY | 691 | 322 | 1,013 |
| BRICK | 4,025 | 1,210 | 5,235 |
| DOVER | 9,309 | 3,550 | 12,859 |
| EAGLESWOOD | 77 | 38 | 115 |
| HARVEY CEDARS | 56 | 40 | 96 |
| ISLAND HEIGHTS | 11 | 74 | 85 |
| JACKSON | 608 | 364 | 972 |
| LACEY | 683 | 391 | 1,074 |
| LAKEHURST | 335 | 242 | 577 |
| LAKEWOOD | 6,759 | 3,294 | 10,053 |
| LAVALLETTE | 293 | 40 | 333 |
| LITTLE EGG HARBOR | 41 | 1 | 42 |
| LONG BEACH | 329 | 63 | 392 |
| MANCHESTER | 480 | 584 | 1,064 |
| MANTOLOKING | 48 | 42 | 90 |
| OCEAN | 154 | 110 | 264 |
| OCEAN GATE | 31 | 12 | 43 |
| PINE BEACH | 84 | 2 | 86 |
| PLUMSTED | 226 | 143 | 369 |
| POINT PLEASANT | 2,711 | 418 | 3,129 |
| POINT PLEASANT BEACH | 1,519 | 296 | 1,815 |
| SEASIDE HEIGHTS | 1,127 | 40 | 1,167 |
| SEASIDE PARK | 419 | 27 | 446 |
| SHIP BOTTOM | 462 | 113 | 575 |
| SOUTH TOMS RIVER | 105 | 120 | 225 |
| STAFFORD | 1,105 | 215 | 1,320 |
| SURF CITY | 311 | 73 | 384 |
| TUCKERTON | 524 | 118 | 642 |
| UNION | 83 | 79 | 162 |
| TOTALS | 34,081 | 12,480 | 46,561 |

SOURCE: Bureau of Research and Statistics, Division of Planning and Research, Department of Labor and Industry, Trenton, N. J.

TABLE IV-13

SUMMARY OF INVENTORY OF MANUFACTURING AND NON-MANUFACTURING SOLID WASTE PRODUCTION BY MUNICIPALITY IN OCEAN COUNTY

| MUNICIPALITY | REPORTED TOTAL TONS/YEAR | REPORTED TOTAL EMPLOYEES |
|---|---|---|
| BARNEGAT LIGHT | 14.66 | 3 |
| BAY HEAD | .00 | 0 |
| BEACH HAVEN | 6.50 | 13 |
| BEACHWOOD | .00 | 0 |
| BERKELEY | 299.31 | 68 |
| BRICK | 4,371.75 | 471 |
| DOVER | 11,367.07 | 2,594 |
| EAGLESWOOD | .00 | 0 |
| HARVEY CEDARS | .00 | 0 |
| ISLAND HEIGHTS | .00 | 0 |
| JACKSON | 4,551.35 | 683 |
| LACEY | 13.00 | 6 |
| LAKEHURST | 135.60 | 263 |
| LAKEWOOD | 10,720.81 | 1,719 |
| LAVALLETTE | 39.00 | 15 |
| LITTLE EGG HARBOR | .00 | 0 |
| LONG BEACH | .00 | 0 |
| MANCHESTER | 173.94 | 59 |
| MANTOLOKING | .00 | 0 |
| OCEAN | .13 | 7 |
| OCEAN GATE | .00 | 0 |
| PINE BEACH | 17.35 | 19 |
| PLUMSTED | .00 | 0 |
| POINT PLEASANT | 93.21 | 113 |
| POINT PLEASANT BEACH | 8,326.16 | 280 |
| SEASIDE HEIGHTS | 2.60 | 7 |
| SEASIDE PARK | .00 | 0 |
| SHIP BOTTOM | 104.00 | 10 |
| SOUTH TOMS RIVER | .52 | 1 |
| STAFFORD | 182.00 | 45 |
| SURF CITY | .47 | 3 |
| TUCKERTON | 104.00 | 17 |
| UNION | 3.25 | 32 |
| TOTALS | 40,526.68 | 6,428 |

SOURCE: Industrial-Commercial Survey Conducted in 1974 by M. Disko Associates.

not respond to the questionnaires. The average production rate of solid wastes that are collected are 20.5 pounds per employee per day in commercial activities and 43.5 pounds per employee per day in industrial activities.

The following table lists the estimated commercial and industrial tonnage in Ocean County in 1974-1975:

| Type of Employment | Estimated Number of Employees | Pounds Per Employee Per Day | Estimated Yearly Tonnage |
|---|---|---|---|
| Commercial | 34,081 | 20.5 | 127,500 |
| Industrial | 12,480 | 43.5 | 99,000 |
| | | | 226,500 Tons/Year |

AGRICULTURAL WASTES PRODUCED IN OCEAN COUNTY

In 1974, there were approximately 12,000 acres of land being farmed in Ocean County. This acreage represents about 2.9 percent of the County's total land area. There are substantial agricultural wastes generated in Ocean County in the growing and harvesting of crops and the breeding of animals. Table IV-14 lists the farms according to municipality, size, etc. as obtained from the official ennumeration of land applied and approved for farm land assessment. The farms included are 5 acres or greater.

Agricultural waste quantities depend on the size of the farm, the type of product cultivated, and type of livestock raised.

TABLE IV-14

OFFICIAL ENNUMERATION OF LAND APPLIED AND APPROVED FOR FARMLAND ASSESSMENT BY MUNICIPALITY

| | APPROXIMATE NUMBER OF FARMS | TOTAL ACREAGE DEVOTED TO AGRICULTURE AND HORTICULTURE | TOTAL ACREAGE ON FARMS |
|---|---|---|---|
| BERKELEY | 3 | 219.00 | 572.38 |
| BRICK | 7 | 83.90 | 130.30 |
| DOVER | 28 | 276.13 | 369.21 |
| JACKSON | 54 | 1,745.66 | 1,928.23 |
| LACEY | 4 | 113.00 | 123.25 |
| LAKEHURST | 1 | 3.00 | 3.70 |
| LAKEWOOD | 10 | 201.39 | 207.89 |
| MANCHESTER | 8 | 295.72 | 322.83 |
| PLUMSTED | 100 | 5,689.00 | 6,651.77 |
| STAFFORD | 5 | 507.20 | 513.36 |
| UNION | 28 | 1,109.88 | 1,165.03 |
| COUNTY TOTAL | 248 | 10,243.88 | 11,987.95 |

Typically, agricultural wastes consist of animal manures, residue from harvested crops, and prunings and residue from fruit orchards. To estimate the waste quantities for Ocean County, an estimate of agricultural units was made from State and local information as well as from a detailed questionnaire mailed to 76 farms in the County. In addition, waste production quantities per agricultural unit were obtained from a study conducted in California in 1968. Table IV-15 shows the inventory of agricultural units. Table IV-16 compiles the waste values as obtained from the "California Solid Waste Management Study (1968) and Plan (1970)".

To determine the approximate amount of agricultural waste production in Ocean County, the waste production factors in Table IV-16 must be multiplied by the number of units in each category in Table IV-15. In 1974, approximately 30,200 tons of agricultural waste was generated in Ocean County. Approximately 67 percent of the waste were manures, with field and row crops comprising the additional 33 percent.

The vast majority of the agricultural wastes are disposed of on the farm. The manures are spread or diced back into the soil for use as a fertilizer and the row crops are usually plowed back under the soil for mulch. Occasionally, garbage and trash that is generated by the farm, and is not disposed of on the farm, will be collected by a private contractor. Reportedly, one such contractor in Jackson charges $4.00 per

TABLE IV-15

OCEAN COUNTY AGRICULTURAL SURVEY

| ITEM | APPROXIMATE NUMBER OF UNITS |
|---|---|
| **ANIMALS** | |
| BEEF CATTLE | 179 head |
| DAIRY CATTLE | 208 head |
| DUCKS, GEESE & RABBITS | 425 birds |
| POULTRY (LAYERS) | 188,500 birds |
| POULTRY (MEAT) | 2,700 birds |
| GOATS, HORSES, PONIES & SHEEP | 405 head |
| SWINE | 2,381 head |
| OTHER LIVESTOCK | 34 head |
| **FRUIT ORCHARDS** | |
| PEACHES | 6 acres |
| **FIELD AND ROW CROPS** | |
| ALFALFA | 242 acres |
| BARLEY | 60 acres |
| BEANS (SOY, SNAP, LIMA) | 411 acres |
| BLUEBERRIES, CRANBERRIES, STRAWBERRIES | 135 acres |
| BROCCOLI, CABBAGE, SPINACH | 112 acres |
| CANTALOUPE, WATERMELON | 18 acres |
| CARROTS | 7 acres |
| CELERY | 1 acre |
| CLOVER | 68 acres |
| CORN (GRAIN, SILAGE, SWEET) | 1,703 acres |
| CUCUMBERS | 15 acres |
| EGGPLANT, SQUASH, PUMPKIN | 47 acres |
| LETTUCE | 4 acres |
| NURSERY | 66 acres |
| OATS | 5 acres |
| ONIONS | 6 acres |
| PASTURE | 1,005 acres |
| PEAS | 6 acres |
| PEPPERS, TOMATOES | 140 acres |
| POTATOES (WHITE AND SWEET) | 11 acres |
| WASTE AND WETLANDS | 535 acres |
| WHEAT | 73 acres |
| WOODLAND | 3,059 acres |
| OTHER CROPS | 1,823 acres |

SOURCE: Motor Vehicle Application, Ocean County, 1973.

TABLE IV-16

AGRICULTURAL WASTE PRODUCTION FACTORS

| SOURCE | ANNUAL WASTE PRODUCTION FACTOR |
|---|---|
| **LIVESTOCK** | |
| HOGS | 1.75 tons/head |
| BEEF CATTLE | 7.5 tons/head |
| DAIRY CATTLE | 13 tons/head |
| POULTRY (MEAT | 4.5 tons/1000 |
| POULTRY (LAYERS) | 47 tons/1000 |
| **FRUITS** | |
| APPLES | 2.25 tons/acre |
| PEACHES | 2.5 tons/acre |
| **FIELD AND ROW CROPS** | |
| CORN | 4.5 tons/acre |
| BROCCOLI, LETTUCE | 4.0 tons/acre |
| CANTALOPES, TOMATOES, WATERMELONS, PUMPKINS, CABBAGE, SPINACH, SQUASH | 3.0 tons/acre |
| BEANS, CUCUMBERS, CARROTS, ONIONS, PEPPERS, EGGPLANT, POTATOES | 2.0 tons/acre |
| BARLEY, OATS, OKRA, WHEAT | 1.5 tons/acre |

SOURCE: "California Solid Waste Management Study (1968) and Plan (1970)", Solid Waste Management Office, EPA, 1971.

month for a farm pick-up. The State Air Pollution code has banned open burning so forest and orchard prunings, and other wastes that were once burned for disposal, now must be either buried or hauled away for disposal. Dead animal carcasses are either buried on the farm or hauled away by a renderer. Table IV-17 lists the more common methods used by farms for solid waste disposal. Thus, most of the agricultural wastes generated on Ocean County farms do not enter the solid waste stream, but rather remain on the farm for use as fertilizers and soil conditioners. An estimated 10% of agricultural wastes are disposed of off the farm in local sanitary landfills.

## MUNICIPAL-TYPE SOLID WASTE QUANTITIES

On a national basis, municipal trash and debris averages about 0.2 pounds per capita per day. This figure includes street sweepings, street litter, dead animals, wooden branches, and tree trimmings, etc. In Ocean County removal of sand from roads, beach clean-up, sea-shells, seaweed, sewage treatment sludges, etc., are a major component of the municipal type solid waste volume. The best available estimate is that 0.3 pounds per capita per day of municipal-type solid wastes are produced in Ocean County. This results in an estimated quantity of 17,900 tons per year from Ocean County.

## SUMMARY AND PROJECTIONS OF SOLID WASTE QUANTITIES IN OCEAN COUNTY

Table IV-18 presents a summary of solid waste quantities in

## TABLE IV-17

### METHOD OF AGRICULTURAL SOLID WASTE DISPOSAL UTILIZED IN OCEAN COUNTY

| TYPE OF WASTE | METHOD OF DISPOSAL |
|---|---|
| ANIMAL MANURES | Spread on fields as a fertilizer and soil conditioner |
| ANIMAL CARCASSES | Buried on site or collected bv renderer |
| FOREST AND ORCHARD* PRUNING AND DEBRIS | Buried or deposited on site or hauled awav |
| CROP RESIDUES* | Plowed into ground |
| RESIDENTIAL FARM WASTES | Buried on site or hauled awav by private solid waste contractor |

* By special permit issued by the New Jersey Department of Agricultural. Diseased crop and orchard residues may be burned on site. With this exception, no open burning is permitted under the State Air Pollution Code.

TABLE IV-18

SUMMARY OF SOLID WASTE QUANTITIES IN OCEAN COUNTY DURING 1974-1975

| COMPONENT OF SOLID WASTES | ESTIMATED TONS/YEAR COLLECTED* | ESTIMATED AVERAGE TONS/WEEK* | ESTIMATED PEAK TONS/WEEK* |
|---|---|---|---|
| Residential | 292,500 | 5,625 | 10,500 |
| Commercial | 127,500 | 2,452 | 4,021 |
| Industrial | 99,000 | 1,904 | 2,000 |
| Agricultural | 3,000** | 58 | 100 |
| Municipal-Type | 17,900 | 344 | 500 |
| Approximate Total | 539,900 Tons/Year | 10,380 Tons/Week | 17,100 Tons/Week |

*Includes adjustment for increased population in the summer.

**Agricultural wastes disposed of off the farm.

Ocean County in the 1974-1975 study period based upon the best available estimates.

The following table presents a summary of solid waste projections for the years 1980 and 1990 based on future estimates of population and commercial and industrial development:

PROJECTIONS OF SOLID WASTE QUANTITIES

| ITEM | 1974-75 | YEAR 1980 | 1990 |
|---|---|---|---|
| Estimated Population | 257,785 | 340,375 | 491,690 |
| Solid Waste Quantities | | | |
| Residential | 292,500 | 409,000 | 682,000 |
| Commercial | 127,500 | 173,000 | 262,000 |
| Industrial | 99,000 | 135,000 | 203,000 |
| Agricultural | 3,000 | 3,000 | 2,500 |
| Municipal | 17,900 | 27,500 | 51,000 |
| | 539,900 tons/year | 747,500 tons/year | 1,200,500 tons/year |
| | or | or | or |
| | 1,479 tons/day | 2,050 tons/day | 3,300 tons/day |

## V. MATERIALS RECOVERY: ACTIVITIES IN OCEAN COUNTY AND GENERAL CONCEPTS

### RECYCLING ACTIVITIES IN OCEAN COUNTY

With the increased production of solid wastes throughout the nation, the diminishing availability of sanitary landfill acreage, and the need for more raw materials, recycling activities are on the increase. Components of our solid waste such as glass, paper, aluminum, tin, and ferrous metals have a marketable value when recovered and returned to industry. Many solid wastes which are currently landfilled are a potential source of revenue.

Within the last few years various groups and organizations throughout Ocean County have opened centers to receive recyclable materials. At the present time substantial quantities of glass, paper, aluminum, and metals are being recovered and returned to industry. These profits are used by the recycling centers for local charities, such as the Boy Scouts, Girl Scouts, churches, etc., and for beautification of parks, schools, etc. In addition to the money raised through recycling, substantial quantities of solid wastes are not landfilled, thus reducing landfill usage and decreasing the fees paid for disposal. A brief summary of the existing recycling activities in Ocean County is presented below.

### BARNEGAT LIGHT

There is no recycling activity at the present time in Barnegat Light.

BAY HEAD

There is no recycling activity at the present time in Bay Head.

BEACH HAVEN

Troop #32 of the Long Beach Island Boy Scouts collect newspapers on a monthly basis. The newspapers are collected once a month at the local resident's homes. Pickup of the newspapers is by truck, with all manpower being provided by the Boy Scouts. The newspaper is then transported to the C & R Waste Material Company via municipal trucks donated for the Boy Scouts use. Recycling activities have been underway for the past 6 months with approximately 84 tons of newspaper being recycled. This activity has brought the troop approximately $925. which has been used for equipment, etc.

BEACHWOOD

Refer to the section on the Ocean County Girl Scouts.

BERKELEY

There is no recycling activity at the present time in Berkeley.

BRICK

An extensive recycling effort has been underway in Brick Township for 2-1/2 years. The volunteer-operated center accepts glass, aluminum, paper, ferrous metals, tin cans, and rags. Half of the revenues acquired from the project are returned to the residents, that is, if a resident brings in a pound of aluminum, at the going price, he would receive 5¢ in return. The center receives excellent cooperation from municipal officials who supply vehicles and manpower. At the present time the center handles about 13 tons of glass, 17 tons of paper, and 3 tons of aluminum per year. Data on the other components was not readily available. The revenues remaining after payments are donated to the Brick Township Boys Club for their use.

DOVER

The Ocean County Council of the Boy Scouts of America operated a recycling center in Dover Township until July 1, 1974. The center recycled glass, paper, aluminum, and ferrous metals. Due to poor cooperation and problems in marketing the collected materials, the center was forced to discontinue operations.

EAGLESWOOD

There is no recycling activity at the present time in Eagleswood.

HARVEY CEDARS

There is no longer any recycling activity in Harvey Cedars.

ISLAND HEIGHTS

There is no recycling activity at the present time in Island Heights.

JACKSON

Glass is being collected and sold to the Brockway Glass Company at the Johnson Elementary School on Larsen Road. Local residents and students bring the glass to the school and a municipal truck transports it to the Brockway Glass Company. The center is run on a volunteer basis and has been operating for two years. Approximately 40 tons of glass is collected yearly with revenues being used to landscape the school grounds. In two years over $1000. has been raised.

LACEY

There is no recycling activity at the present time in Lacey.

LAKEHURST

There is no recycling activity at the present time in Lakehurst.

LAKEWOOD

The Environmental Commission of Lakewood conducts recycling activities in the yard adjacent to the Department of Public Works Garage. The center has been open for one year and accepts glass, paper, and aluminum. Recyclable materials can be dropped off Monday through Friday from 10:00 A.M. to 4:00 P.M. and Saturday from 10:00 A.M. to 12:00 Noon. On Saturday, the residents are paid 1 cent per pound for glass and 2 cents per pound for aluminum. Quantities and income data were not readily available.

LAVALLETTE

Lavallette recently opened a center to collect paper, cardboard, and magazines. The materials are stored in a 40-foot trailer and sold to the Whippany Paper Board Company. Shipments to Whippany Paper Board Company will only be made when the trailer is full. Data on quantities and income were not available due to the short period of operation. Revenues from this operation will be used for Lavallette's Bicentennial Celebration Committee.

LITTLE EGG HARBOR

There is no recycling activity at the present time in Little Egg Harbor.

## LONG BEACH

There is no longer any recycling activity in Long Beach.

## MANCHESTER

Refer to the section on the Ocean County Girl Scouts.

## MANTOLOKING

There is no recycling activity at the present time in Mantoloking.

## OCEAN

There is no recycling activity at the present time in Ocean.

## OCEAN GATE

There is no recycling activity at the present time in Ocean Gate.

## PINE BEACH

The Evangelical Congregational Church has been recycling glass, paper, and aluminum for the past two years. Municipal trucks are used at the center to transport the recycled materials. Separation of glass by color is required. Current figures show approximately 42 tons of glass, 36 tons of paper, and 4 tons of aluminum per year pass through the center. In two years the center has received over $1000. from the sale of glass, aluminum, and miscellaneous metals. Data on the paper recycled was not available. The center is manned by volunteers and assisted by the municipality which supplies trucks to transport the materials to the purchasers.

## PLUMSTED

There is no recycling activity at the present time in Plumsted.

## POINT PLEASANT

Point Pleasant started its recycling center in the summer of 1972. It is manned by volunteers from the local Key Club and Keyettes. Materials can be dropped off all week long and from 8:00 A.M. to 12 Noon on Saturdays. The center has 5 storage bins and 4 dump trucks at its disposal to handle the approximately 25 tons of glass, 55 tons of paper, 4 tons of aluminum, and 6 tons of metal which pass through the center yearly. Residents who recycle at the center are paid half of the going market for the materials they bring in. The remainder of the revenues are divided between the Key Club, Keyettes, and the local Environmental Commission. This money is then used for parks and beautification projects.

## POINT PLEASANT BEACH

On Saturdays from 9:00 A.M. to 1:00 P.M., the Point Pleasant Beach Recycling Center accepts glass, paper, aluminum, and metals. In the past year the center has handled 24 tons of glass, 63 tons of paper, 5 tons of aluminum and 1 ton of metal. Data as to income was not available due to the fluctuation of market price. The center consists of 1 loader, 2 trucks on a part-time basis, 5 storage bins, and a shed for cardboard. The residents who bring materials to the center are reimbursed as follows: glass - 1/2¢ per pound, paper - 20¢ per 100 pounds, aluminum - 4-1/2¢ per pound, tin - 15¢ per 100 pounds. At the present time municipal employees run the center.

## SEASIDE HEIGHTS

The newly-opened recycling center in Seaside Heights accepts glass, paper, and metals. The center provides for local pickups on call for the residents. Equipment at the center includes 8 storage bins and 2 trucks. The majority of the manpower for operating the project is supplied by the municipality. Current estimates of quantities for the new center are 3 tons of glass, 80 tons of paper, 1 ton of aluminum, and 8 tons of metal per year. Income data was not available at this time.

## SEASIDE PARK

There is no recycling activity at the present time in Seaside Park.

## SHIP BOTTOM

There is no recycling activity at the present time in Ship Bottom.

## SOUTH TOMS RIVER

Cub Scout Pack #24 has been recycling paper on the first Saturday of every month for the past 10 years. This operation amounts to approximately 30 tons of paper per year. Revenues from the sale of the paper vary from $0.25 to $1.00 per hundred pounds depending on the market price. The average income from the paper sales has been approximately $800. per year.

## STAFFORD

There is no recycling activity at the present time in Stafford.

## SURF CITY

There is no recycling activity at the present time in Surf City.

## TUCKERTON

There is no recycling activity at the present time in Tuckerton.

## UNION

There is no recycling activity at the present time in Union.

## OCEAN COUNTY GIRL SCOUT COUNCIL

The Ocean County Girl Scout Council runs an extensive glass recycling project which utilizes nine recycling centers located within Dover, Lakewood, and Manchester Townships and Beachwood Borough. The centers used are located as follows: 1) Leisure Village, 2) Leisure Village East, 3) Crestwood #1, 4) Crestwood #2, 5) Manchester Town Hall, 6) First National Bank of Toms River, Ocean Beach Branch, 7) Lutheran Church, Beachwood, 8) Cedar Glen City, and 9) Council Headquarters. Glass has been recycled by these centers since 1971. All collection centers are open 24 hours a day and utilize large barrels to store the glass. Volunteer and county employees aid in the operation and transportation of the glass to the Brockway Glass Company. These centers recycled a total of 306 tons of glass in 1973, which amounted to approximately $6100. for use by the Girl Scouts.

## SOURCE SEPARATION OF RECYCLABLE MATERIALS

Separation of recyclable materials from solid wastes has been practiced since the early 1900's. Manual separation currently is the most widely-used means of removing recyclable materials from solid wastes when quantities are limited. The effectiveness of manual separation of recyclable materials was proven during the Second World War. Metals and other raw materials were in short supply, so separation and recovery of these materials was practiced to bolster dwindling reserves.

To effectively separate materials at the source of generation, the voluntary efforts of individual residents or firms to separate and prepare materials according to prescribed guidelines is needed. For example, glass must be separated by color; clear, brown, and green, and all metal contaminants, such as caps and rings, removed. Aluminum, tin, and bi-metal cans must be properly identified and separated. Newspapers generally have to be separated from other paper wastes, such as magazines and packaging materials, and then must be bundled and tied.

After the recyclable materials are separated from the waste stream, it is important to prevent contamination of each fraction. Contamination before transport to the secondary materials dealers can result in reduced market prices, and in some cases rejection of the materials. It is therefore necessary to store each category of waste in separate storage containers. The use of plastic or paper bags and/or metal or plastic containers at the source of separation will assure a minimal degree of contamination. Transport of the wastes to the reclamation center must also be performed carefully to prevent contamination.

In the past few years local recycling centers have become popular because of the available markets for the reclaimed wastes. The small quantities of materials contributed by individual residents amount to large volumes when combined at the centers. Large volumes of materials are more readily purchased and handled by the secondary materials industry.

Several forms of processing can be performed at the recycling center to enhance resale value and provide for more efficient transportation of the materials. These processes include: 1) crushing of glass and cans to reduce volume, and 2) compaction and baling of paper and cardboard. These materials can then be effectively stored until sufficient quantities are available for transport to the secondary materials users.

PUBLIC ATTITUDES TOWARDS SOURCE SEPARATION

The public is constantly reminded of the dwindling supply of natural resources throughout the world. On a yearly basis, millions of tons of potentially reuseable materials are landfilled and, hence, lost to industry and the market place. Although the general public is aware of the decreasing reserves of raw materials and knows that a problem exists, many people do not know how to deal with the problem, and many others are not sufficiently motivated to alter life-styles in an effort to recycle and recover materials. For example, a recent survey in Summit, New Jersey, revealed that over 90 percent of the respondents "...were aware that there was a solid waste problem and felt they had some responsibility to help solve it...", yet, only 52 percent indicated that they had participated, at one time or another, in the community's well-publicized and well-run recycling program.*

In a questionnaire survey of over 114 community recycling programs throughout New Jersey, M. Disko Associates found that 54% of the officials of recycling programs felt that general public interest

* Survey conducted in the City of Summit by members of KEEP (Keys to Education of Environmental Protection), January 1972

and involvement in recycling programs was poor, as shown below:

Responses by Community Recycling Center Officials to the Question: How would you characterize the interest of the general public in voluntary recycling?

| RESPONSE | PERCENT OF OFFICIALS RESPONDING |
|---|---|
| Poor Interest and Involvement | 54% |
| Good Interest and Involvement | 32% |
| No Response | 4% |
| No Longer Engaged in Recycling | 10% |

Responses by Community Recycling Center Officials asked to measure the level of voluntary participation in the area serviced by their Recycling Center.

| ESTIMATED RANGE IN PUBLIC PARTICIPATION IN RECYCLING PROGRAMS | PERCENTAGE OF OFFICIALS RESPONDING |
|---|---|
| 0 - 19% of the Population | 52% |
| 20 - 39% of the Population | 10% |
| Over 40% of the Population | 0% |
| Unknown or No Response | 38% |

Based on the responses to the questionnaire by M. Disko Associates, it is evident that where community recycling programs are available to the public, voluntary participation is probably only between 10 and 20 percent of the total population.

The public has been conditioned to dispose of solid waste in the easiest and most convenient way. Source separation, however, requires an effort and some inconvenience to the induvidual generator. Materials must be carefully sorted into categories, contaminants such as metal rings, labels, etc., must be removed, and then the materials must be stored until collection or transport by the individual or some organization to the recycling center.

With few exceptions, community recycling programs are operated by a relatively small group of dedicated volunteers who donate their time and efforts to develop and operate the centers. Since these volunteers have families, jobs, and other responsibilities, the amount of time they have available to devote to recycling efforts is, understandably, limited. For this reason, centers are generally opened for limited hours. Because of limited financial resources, the centers must generally rely on voluntary personnel and in many cases, donated equipment and facilities for their operations. Because of the uncertainty of these factors, recycling centers may be forced to alter their operating hours, reduce the amount and types of materials they accept, and change the location of their facilities. This, in turn, has a tendency to discourage overall citizen participation in the programs. There are few, if any, direct incentives for individual residents to participate in voluntary recycling programs. Recycling requires time, effort, and in those cases where individual residents must haul their recyclable materials to a reclamation center, expense. Even where recycling is financially rewarding, the general public, has opted for convenience rather than conservation and limited economic gain.

A common problem that is experienced by the majority of recycling groups throughout the State is the lack of support and assistance by local government officials for recycling. *In response to the survey of New Jersey reclamation centers, conducted by M. Disko Associates, the individual centers suggested increased governmental support in the following areas:*

- *Donation of manpower and equipment.*
- *Publicity and public education.*
- *Assumption of recycling as municipal responsibility.*
- *Coordination of recycling activities on a regional or county basis.*
- *Ordinances requiring individual residents to separate and recycle materials.*

To determine the exact effect of governmental assistance in recycling would be a difficult task, however, it is safe to assume that support of recycling efforts and additional publicity by government officials and agencies will motivate community participation in recycling activities. The support of local government in supplying some manpower, vehicles, and facilities to the recycling effort would help eliminate inherent problems now experienced by totally volunteer recycling centers.

Therefore, it appears that assistance by local government can be instrumental in increasing the effectiveness of recycling centers.

## RECYCLING PROGRAMS IN OTHER AREAS: THREE CASE STUDIES

### FLEMINGTON, NEW JERSEY

One of the oldest, continually operated, voluntary recycling centers in New Jersey is run by the Hunterdon Reclamation Center, Inc. at a shopping center parking lot in Flemington, New Jersey. Individual citizens and citizen groups bring their recyclable materials to the Center, which is staffed by paid and volunteer help. The Center is open every Saturday from 9:30 A.M. to 2:30 P.M. The Center accepts glass, newspapers, and tin cans. The glass is separated by color and stored in 5 cubic yard steel containers. Paper is stored and compacted in a 20 cubic yard packer truck which is available on Saturdays. The tin is passed through a crushing machine and is stored in 5 cubic yard containers.

Once a week, a private solid waste contractor, under contract with the Center, hauls the waste paper to a paper dealer. The waste paper is reportedly used in the manufacture of wallboard. Approximately four times a month, a load of glass is transported to a glass company, and once a month, tin cans are transported to a detining company. For this service, the contractor receives 100 percent of the income from the sale of paper and tin and 50 percent of the income from the sale of glass.

Income which the Hunterdon Reclamation Center receives is used to pay civic groups, such as the Boy Scouts, for glass which the groups collect and bring to the Center. The bulk of the recycled material, however, is brought to the Center by individual residents who "donate" the material to the Center. Additional monies are spent to help staff the Reclamation Center on Saturday mornings and to support a scholarship fund for Hunterdon County residents enrolled in the Rutgers University Environmental Science Program.

During 1973, the Center reportedly received over 680 tons of recyclable materials, including 360 tons of glass, 264 tons of newspapers, and 60 tons of tin cans.

### MADISON, WISCONSIN

The City of Madison, Wisconsin, in a special salvage program, recovers an estimated 42 percent of the newspapers discarded by its residents. The newspapers are voluntarily tied and separated by citizens for pickup with regular household wastes. The program was initiated by the City for several reasons: 1) to conserve space in its landfills, 2) to help eliminate the problem of blowing papers at the fills, and 3) to market a portion of the solid wastes it collected.

In order to avoid the extra expense of separate collections for newspapers, the City outfitted its compaction trucks with 1 cubic yard newspaper racks placed along the underside of the body. After each day's collection, the newspapers are placed in a trailer furnished by the newspaper dealer who sorts and processes the paper and sends it to a de-inking mill near Chicago. All delivery costs are assumed by the dealer.

During a recent twelve-month period, the City collected 2,829 tons of newspapers at a cost of $6,605. (figure does not include start-up costs such as outfitting the packer trucks with newspaper racks at a cost of $170. to $300. each). The 2,829 tons of newspapers were sold for $19,237. for an average profit of $4.46 per ton.

## LOS ANGELES COUNTY, CALIFORNIA

In Los Angeles County, the use of certain amounts of glass cullet by glass manufacturers is required to satisfy air pollution control regulations. As the amount of cullet is increased, the amount of sulfurous emissions into the atmosphere is decreased. Hence, minimum cullet use ratios are specified by the local air pollution control district.

Under these regulations, eight glass container manufacturers in the Los Angeles area initiated a glass recovery program. Each manufacturer provides facilities to purchase glass containers from the public at a price of 1¢ per pound ($20. per ton). The combined program has been collecting an average of 175 tons per week.

Presently, the program is uneconomical since the glass manufacturers pay $20. per ton for the cullet, which is estimated to be approximately $1.00 a ton more than it would cost to manufacture glass containers with raw materials. Handling costs are more for the purchased cullet and the manufacturer is also faced with potentially costly contamination problems. However, the air pollution requirements, mandating increased levels of cullet use, override technical and economic considerations.

## MANDATORY SOURCE SEPARATION OF RECYCLABLE MATERIALS

One suggestion frequently made by many recycling officials and citizens concerned with the problems of solid wastes is that legislation requiring mandatory source separation of recyclable materials such as paper or glass, etc., be enacted. Legislation of this type has been enacted in a number of New Jersey municipalities including Avon-by-the-Sea, Clifton, Elizabeth, Irvington and others, with varying degrees of success.

In January 1972, the Borough of Avon-by-the-Sea (Monmouth County) approved an ordinance requiring the separation of newspapers, glass bottles, and aluminum cans from other solid waste materials. Residents place the separated materials at curbside where they are collected once each week by municipal collection trucks. Since the ordinance contains no penalties for noncompliance, the reported recycling rate of 20 to 40 percent for newspapers and 6 to 12 percent for glass is not much higher than what would be expected at a well-publicized community recycling center.

The City of Clifton (Passaic County), on January 3, 1974, passed an ordinance for a demonstration project which requires each resident to separate and tie newspapers for recycling. Under the ordinance, each resident will be required to separate and bundle newspapers and place them at curbside at specified times for collection. At curbside, the newspapers will be collected twice each month by two paper dealers, who will pay the City of Clifton a specified amount for the privilege of collecting and selling the waste paper. The ordinance specifies that, with the exception of the paper dealers, no one is permitted to take bundled newspapers placed at curbside during the period from 6:00 P.M. on the day preceding scheduled newspaper collections until the papers are collected.

Recently, the City of Elizabeth (Union County) initiated two programs to encourage recycling. The first program, aimed at encouraging the use of products made from recycled materials, specifies that the City Purchasing Department "... shall require that items be made in whole or in part with the use of recycled materials whenever the quality meets all other specifications". The resolution further requires that all bonded stationery contain a minimum of 20% (by weight) recycled fibers. The second program encourages individual residents to separate newspapers for recycling. By city ordinance, residents are requested to place bundled newspapers at curbside where they are collected by volunteer groups for recycling. The City has established a $500. fine for unauthorized persons caught removing the newspapers from the curb.

Several years ago, the Town of Irvington (Essex County) enacted a voluntary ordiance which requested that residents separate and bundle newspapers to be placed at curbside prior to regular refuse collection on Saturdays. Volunteer groups collect and sell the newspapers. If the newspapers are not collected prior to regular collection, the separated newspapers are collected along with other refuse and hauled to a landfill for disposal.

Reportedly, 10% of the population cooperates, according to one official, but no reliable figures on the amount of newspapers collected and citizen participation were available.

Legislation by municipal ordinance for mandatory separation of recyclable materials has been questioned by many municipal officials. These officials believe that an ordinance backed by penalties for non-compliance, would be difficult to enforce from both a political and practical viewpoint. Practically, the effort to monitor individual residences to insure compliance would require a large scale manpower and exorbitant expense. From a political viewpoint, local governmental officials are confronted with pressures from environmentalists, on one hand, to develop recycling programs with source separation, while, on the other hand, residents are extremely sensitive about increased costs and governmental involvement in their daily lives. Therefore, it appears that local governments are hesitant about imposing mandatory separation.

This position was supported, in a state-wide survey of local recycling groups, conducted by the New Jersey Department of Environmental Protection. While over 67 percent of the respondents indicated they favored a municipal ordinance, requiring source separation, over 70 percent felt that the majority of residents would not comply with such an ordinance.

## SEPARATION AND RECOVERY AT A CENTRAL PROCESSING FACILITY

As noted in a previous section, the recovery of salvagable materials from solid wastes can be accomplished by manual source separation. Recovery of materials can also be achieved at a central processing facility where mechanized processes such as shredding, magnetic separation, air classification, water separation, optical sorting, screening and ballistic separation are used to separate and recover salvagable materials from ordinary mixed refuse.

Centralized processing, sorting, and separation of recyclable materials, eliminates the need for source separation. The intended use of the recyclable materials will dictate the type of separation process required. For example, if newspapers are to be recovered and reprocessed into newsprint, source separation would be required to eliminate the contamination of the newspapers by other wastes. However, if the newspaper and other light fraction components (plastic, paper, yard and garden wastes, etc.) are to be used as a supplemental fuel, central processing is required.

One of the major advantages of processing solid wastes in a centralized materials recovery center is that the individual resident is not required to separate manually the recyclable from the non-recyclable waste materials. The mixed solid wastes are collected as usual by existing collection contractors and transported to a processing center for separation into the various recyclable fractions. The separated fractions are then transferred in their processed form to a secondary materials dealer or to an energy recovery system. Solid waste fractions which are non-recoverable components, are landfilled or further processed to reduce volume prior to landfilling. The relative volume of the non-recoverable fraction depends, of course, on the capability of the particular processing facility to economically recover materials.

In investigating the merits of a central processing facility, several essential factors must be considered. First, the competing processing and disposal systems must be evaluated from an economic and environmental point-of-view. Because of new environmental standards regulating disposal, and decreasing areas for landfilling operations, the costs of solid waste disposal in Ocean County are expected to rise. Secondly, the reliability or technological feasibility of implementing a central resource recovery facility must be evaluated. Much of the resource recovery technology, including shredding, air classification, magnetic separation, etc., has already been tested and incorporated into solid waste management systems in various locations in the nation. Additional recovery processes have been adapted from industrial processes (screening and pulping, for example, from the mining and paper industries) or designed and applied from proven concepts.

## LEGISLATION TO ENCOURAGE THE RECOVERY OR UTILIZATION OF RECYCLABLE MATERIALS

The idea of using municipal ordinances to mandate source separation of recyclable materials has been discussed in a previous section. However, there are other types of legislation, either passed or introduced, which encourage separation and materials recovery, and the use of products made from recyclable materials.

For example, the State of Oregon and the City of Bowie, Maryland enacted legislation regulating the sale of malt and soft drink beverages in non-returnable containers. The Bowie, Maryland ordinance, passed in March of 1971, provides for penalties of up to 30 days imprisonment and a $100. fine for any indiviaual found guilty of selling malt and soft drink beverages in a container on which a deposit of at least $.05 is not charged at the retail level, and on which the deposit is not returned when the container is returned to the retail outlet.

Since October 1972, Oregon requires that all beer and soft drink containers sold carry a deposit and refund value. The legislation also bans the use of cans with pull-top openers. The primary purpose of the law, which was tested and upheld by the Oregon Circuit Court, is to reduce and control the amount of litter in the State. According to Oregon officials, since the enactment of the legislation, litter from beverage containers has decreased by some 49 percent. Approximately two years ago, a similar measure was introduced in the New Jersey State

Legislature. However, the measure was never enacted.

Several local governments, the State of New Jersey, and the Federal Government have revised their purchasing requirements to encourage governmental agencies to purchase products, such as stationery, containing recycled materials. New Jersey, in 1971, adopted the following statutes concerning purchase of recycled materials:

N.J.S.A. 52:34-21

The Legislature finds that the industrial economy of the State requires a shift from a use and discard approach to a closed cycle of use and salvage of solid waste.

N.J.S.A. 52:34-23

In purchasing items which are made both with and without the use of any recycled materials, the Division of Purchase and Property, whenever the price is reasonably competitive and the quality adequate for the purpose intended, shall give preference to those items which are made in whole or in part from recycled materials.

N.J.S.A. 52:34-24

In advertising for bids for items which are made both with and without the use of any recycled materials, the division shall state its preference for items made in whole or in part with the use of recycled materials whenever the price therefor is reasonably competitive and the quality satisfactory.

Federal legislation under consideration includes a number of policies which would enhance resource recovery by the general public. The trends of these policies include the following:

- Adoption of purchasing policies that favor products made of recycled materials,

- More favorable tax incentives, freight rates, and price structures for secondary materials, and
- Technical and financial aid to develop resource recovery systems,
- Control, regulation and banning of products which cause unusual disposal problems.

## VI. LEGAL, ADMINISTRATIVE AND FINANCIAL ASPECTS OF SOLID WASTE MANAGEMENT IN OCEAN COUNTY

Before any county-wide or regional solid waste disposal system, such as a sanitary landfill or a resource recovery system, can be implemented, an adequate administrative system with requisite financial, jurisdictional, legal, and operational capability is required. In order to establish a successful and comprehensive solid waste management system in Ocean County, an administrative system or structure with the required legal and economic resources to implement the technical solution is required.

This section of the report will identify and evaluate the existing legal framework and administrative structures available to county and municipal governments in Ocean County for solid waste management. A number of levels of government influence or regulate solid waste management in Ocean County. Table VI-1 lists a general summary of the affect of various levels of government on solid waste management.

### COUNTY AND MUNICIPAL INVOLVEMENT IN SOLID WASTE MANAGEMENT

Prior to 1970, responsibility for the provision of solid waste collection and disposal services was primarily with local municipal government which either provided the service itself, contracted with a private collector, or permitted each individual resident to hire a private contractor to collect and dispose of accumulated wastes. Legislation concerning municipal involvement

## TABLE VI-1

## LEVELS OF GOVERNMENT AFFECTING SOLID WASTE MANAGEMENT IN OCEAN COUNTY

| AGENCY | SOLID WASTE MANAGEMENT PLANNING | REGULATORY | ADVISORY AND TECHNICAL ASSISTANCE | FINANCING OF SOLID WASTE MANAGEMENT SYSTEMS | CONSTRUCTION OPERATION & MAINTENANCE |
|---|---|---|---|---|---|
| FEDERAL Environmental Protection Agency | Limited Funding of Solid Waste Planning Grants as appropriations permit | Generally established guidelines for adoption by State and local governments | Technical, advisory and training assistance to regional, state and local governments | Very limited funding of solid waste systems. Emphasis on resource recovery | With the exception of demonstration projects, no active role |
| INTERSTATE Tri-State Regional Planning Commission | Public interstate agency engaging in regional planning. Serves as a data source for hundreds of local governmental units in the New York, New Jersey and Connecticut region | No active role | General Planning reports. Sponsorer of public conferences on solid waste management | No active role | No active role |
| STATE Department of Environmental Protection (DEP) | Developed and released State Solid Waste Management Plan in 1970. No planning grants available for the development of solid waste management systems | Under the "Solid Waste Management Act" of 1970, DEP empowered to regulate the environmental and public health-related aspects of solid waste management systems. | Data and Information source to local operational and planning agencies | At present, DEP does not have grant monies available for financing the construction of solid waste systems | Permitted to operate and maintain experimental facilities. New facilities must file plans with DEP for approval |

## TABLE VI-1, CONTINUED

## LEVELS OF GOVERNMENT AFFECTING SOLID WASTE MANAGEMENT IN OCEAN COUNTY

| AGENCY | SOLID WASTE MANAGEMENT PLANNING | REGULATORY | ADVISORY AND TECHNICAL ASSISTANCE | FINANCING OF SOLID WASTE MANAGEMENT SYSTEMS | CONSTRUCTION OPERATION & MAINTENANCE |
|---|---|---|---|---|---|
| STATE Department of Public Utilities (P.U.C.) | No active role at present | Under the "Solid Waste Utility Control Act of 1970", the P.U.C. was granted power to regulate the economic aspects of solid waste collection and disposal | Data and information source to local operational and planning agencies | With the exception of regulating rates, no active role | New Facilities required to register with the P.U.C. |
| COUNTY | "County Solid Waste Disposal Financing Law" of 1970 empowers any county in New Jersey to plan, purchase, and/or construct solid waste processing and disposal facilities. Services may be provided under contract with a private corporation | County Board of Chosen Freeholders may promulgate rules and regulations concerning the environmental and health aspects of solid waste collection and disposal. A county-operated solid waste facility can operate under a limited-use permit issued by the P.U.C. | While developing county-wide solid waste management plans, the county serves as a source of data and information to local governing bodies and citizens | Under the "County Solid Waste Disposal Financing Law", counties are permitted to issue general obligation bonds for the construction or purchase of solid waste processing and disposal facilities. The county is further empowered to operate, manage, and control any such facility | |

TABLE VI-1, CONTINUED

LEVELS OF GOVERNMENT AFFECTING SOLID WASTE MANAGEMENT IN OCEAN COUNTY

| AGENCY | SOLID WASTE MANAGEMENT PLANNING | REGULATORY | ADVISORY AND TECHNICAL ASSISTANCE | FINANCING OF SOLID WASTE MANAGEMENT SYSTEMS | CONSTRUCTION OPERATION & MAINTENANCE |
|---|---|---|---|---|---|
| INTER-MUNICIPAL SERVICES | Several State Statutes allow the inter-municipal provision of solid waste services by establishing a Joint Meeting or a Solid Waste Management Authority | May regulate the environmental and health aspects of solid waste collection, processing and disposal within district | Through planning process, inter-municipal agency provides data and information to participating municipalities | Authority empowered to issue revenue bonds for the construction or purchase of solid waste facilities. Member municipalities of the Joint Meeting may issue general obligation bonds for their share of construction costs | |
| MUNICIPAL | Municipalities are permitted to plan and develop solid waste collection, processing and disposal capabilities, either individually, in joint agreement with other municipal or county governments, or under contract with a private corporation | Municipal governing body may promulgate rules and regulations concerning the environmental and health aspects of solid waste collection and disposal. Local health departments empowered to enforce local health and environmental ordinances and DEP rules and regulations | Provide pertinent data and information for solid waste management planning | Municipal governments permitted to issue general obligation bonds for the construction of solid waste processing and disposal facilities. The municipality may operate the facility itself or contract with a private corporation for construction and/or operation and maintenance of the solid waste facility | |

in solid waste collection, storage and disposal is permissive rather than mandatory in nature. Table VI-2 lists selected New Jersey statutes concerning solid waste management at the municipal level.

While many of the larger municipalities provided, under this permissive legislation, municipally-funded collection and disposal systems operated either by a municipal department or under contract with a private solid waste contractor, the smaller, more rural communities were serviced by a number of small private collection firms which provided collection services to individual residents.

Following World War II, Ocean County, like many of the counties in New Jersey, experienced tremendous growth. This population growth, combined with increasing per capita solid waste generation as well as increased industrial and commercial growth, created new pressures on existing solid waste management systems, especially existing disposal facilities. As vacant land is developed for residential, commercial, and industrial uses, municipalities find it increasingly difficult to find suitable land for solid waste disposal operations.

In 1948, under pressure from a number of communities, the New Jersey Legislature passed the "Incinerator Authorities Law of 1948". The new law reflected the growing concern for establishing suitable solid waste disposal facilities. For the first time,

## TABLE VI-2

## NEW JERSEY STATUTES CONCERNING SOLID WASTE MANAGEMENT AT THE MUNICIPAL LEVEL

| TITLE | DESCRIPTION OF STATUTES |
|---|---|
| N.J.S.A. 26:3-31 | Enumeration of powers of local Boards of Health including regulation and control of the dumping of garbage. |
| N.J.S.A. 40:48-2.13 | Act describes powers of municipality to enforce removal of garbage, trash, and debris from private lands for the preservation of public health, safety and welfare. |
| N.J.S.A. 40:48B-1 "Consolidated Municipal Services Act" | Any two or more municipalities, by ordinance, may enter into a joint contract, for a period not to exceed 40 years, to provide for the formation of a joint meeting for the provision of solid waste services. Powers of the Joint Meeting include: acquire real property by purchase, lease, grant, gift, or condemnation; to contract with other municipalities, not members of the Joint Meeting, or persons for provision of solid waste services; to acquire land in any municipality in the State except where governing body of such municipality, by resolution, finds that the operation or use of land would adversely affect its governmental operations. Costs and expenses of the joint operation are to be apportioned among the contracting municipalities. Each participating municipality may appoint a member to a management committee. The joint contract may be terminated upon the adoption of a resolution by the governing bodies of two-thirds of the participating municipalities. |
| N.J.S.A. 40:66-1 | Municipalities permitted to provide for the collection and disposal of solid wastes and to operate and maintain incinerator facilities. |

TABLE VI-2, CONTINUED

NEW JERSEY STATUTES CONCERNING SOLID WASTE

MANAGEMENT AT THE MUNICIPAL LEVEL

| TITLE | DESCRIPTION OF STATUTES |
|---|---|
| N.J.S.A. 40:66:-2 | Municipalities permitted to construct incinerator facilities and to acquire property by purchase, gift, or condemnation. |
| N.J.S.A. 40:66-3 | Municipality permitted to acquire by purchase, lease, or condemnation, unimproved lands, within or without the municipality, to be used for the disposal of solid wastes. No land can be acquired or used for such purposed located outside the municipality without the express consent of the governing body and the Board of Health of the municipality in which the land is located. |
| N.J.S.A. 40:66-4 | Municipality may contract with any person for the collection and disposal of its solid wastes. Contracts exceeding $2,500.00 must be by competitive bidding. |
| N.J.S.A. 40:66-5 | Governing body of municipality may provide for solid waste services out of its general revenues or fix rates to be charged individual customers. |
| N.J.S.A. 40:66-6 | Municipalities may, by resolution, grant to any person a franchise for the construction and operation, within its limits, of an incinerator facility for a period not to exceed 20 years. |
| N.J.S.A. 40:66-7 | No municipality or individual is permitted to locate a solid waste facility in another municipality without first receiving the consent of the governing body in which the facility is located. |

TABLE VI-2, CONTINUED

NEW JERSEY STATUTES CONCERNING SOLID WASTE

MANAGEMENT AT THE MUNICIPAL LEVEL

| TITLE | DESCRIPTION OF STATUTES |
|---|---|
| N.J.S.A. 40:66A-1 et.seq. "Incinerator Authorities Law of 1948" | Governing bodies of one or more municipalities may, by ordinance, create a solid waste incinerator authority. Powers are vested in the members of the authority who are appointed by the participating municipal governing bodies. Powers of authority include: acquire land for incinerator by purchase, gift, or condemnation, issue revenue bonds, use service charges and other revenues, charge and collect rates and fees, and enter into contracts for the collection, treatment and disposal of solid wastes. Every municipality within authority district must use the incinerator. |
| N.J.S.A. 40:66A-32 et. seq., "Solid Waste Management Authorities Law of 1968" | Governing bodies of one or more municipalities may, by resolution, create a solid waste management authority. Powers are vested in authority members who are appointed by the participating municipalities (one member from each municipality). Decisions of the authority are carried by majority vote, except in the following, which require the unanimous vote of all members:<br>1) selection and designation of sites<br>2) decision to issue bonds<br>3) fixing and determining rates and fees<br><br>General powers of the authority include: issue revenue bonds, charge and collect rates and fees, acquire property within authority district by condemnation, enter into contracts for the collection and treatment of solid wastes, and grant host community payments in lieu of taxes. The services of the authority will be used by the owners and occupants of all lands, buildings and premises within the district and the State guarantees not to permit the |

TABLE VI-2, CONTINUED

NEW JERSEY STATUTES CONCERNING SOLID WASTE

MANAGEMENT AT THE MUNICIPAL LEVEL

| TITLE | DESCRIPTION OF STATUTES |
|---|---|
| "Solid Waste Management Authorities Law of 1968" | operation of any competitive solid waste treatment facility within the authority's district. |
| N.J.S.A. 40:152 et.seq. | The governing body of any Township may, by ordinance, designate solid waste collection districts. Within each district, the Township committee may provide, either by itself or by contract, solid waste collection services, and may cause to be raised, within the limits of the special district, sufficient funds to pay for the service. |
| N.J.S.A. 49:63-43 et.seq. | Governing body of any municipality may enter into a contract with any person, firm, or corporation, public or private, for the collection of solid waste and the construction, maintenance, and operation of any solid waste treatment and disposal facilities. The length of the contract shall not be more than 20 years. After specifications are drawn, the municipality shall accept bids for the contract. The statute also permits two or more municipalities to enter into a joint contract for the provision of the service. |
| N.J.S.A. 49:90-1 et.seq. | The governing body of any borough may, by ordinance, create special solid waste districts. Within each designated district, the voters, each year, select a 5-member board of garbage commissioners and determine the amount of money to be raised for the ensuing year. This sum of money is assessed on all property within the district and collected as taxes. The commissioners are empowered to purchase, lease and convey real and personal property. |

at least from the viewpoint of state legislation, the provision of solid waste disposal services was viewed as transcending individual municipal boundaries and financial capabilities. The Incinerator Authorities Law permits one or more municipalities to create an authority to construct and operate an incinerator facility to provide solid waste disposal services to municipalities within the Authority's district. The Authority is empowered to issue revenue bonds and to charge and collect fees from users of the incinerator facility. Land for the incinerator facility can be acquired by the Authority, by purchase, gift, or condemnation.

In 1960, the State Legislature passed a comprehensive bill dealing with municipal joint service contracts, entitled the "Consolidated Municipal Services Act". Specifically, as far as solid waste management is concerned, the law permits any two or more municipalities, by ordinance, to enter into a joint contract, for a period not to exceed 40 years, for the creation of a joint meeting to provide inter-municipal services such as solid waste collection, processing and disposal. Powers of the joint meeting include: the ability to acquire real property by purchase, lease, grant or condemnation; to contract with other municipalities, not members of the joint meeting, and/or persons for the provision of services; and to apportion the costs and expenses of the joint meeting among the contracting municipalities.

Another major piece of legislation, the "Solid Waste Management Authorities Law of 1968" permits one or more municipalities to create a solid waste management authority to collect, treat and dispose of solid waste. This law was basically created to allow the Quad Cities (Paterson, Clifton, Passaic and Wayne) to form an authority to develop a regional incinerator facility. The Authority is empowered to issue revenue bonds; charge and collect fees for its services; acquire land, within the Authority district, for any solid waste facility by purchase, gift or condemnation; and enter into contracts with any municipality for the collection and treatment of solid wastes.

While the three statutes, the "Incinerator Authorities Law", the "Consolidated Municipal Services Act", and the "Solid Waste Management Authorities Law", permitted the inter-municipal provision of solid waste services, the actual implementation and provision of inter-municipal services has not been very successful. For example, the Lower Passaic Valley Solid Waste Disposal Authority (Quad Cities) created in 1968 and consisting of the municipalities of Passaic, Paterson, Clifton and Wayne in Passaic County, has been unable, primarily because of site location problems, to implement its planned high-temperature incinerator. Similarly, Joint Meeting Number One for Solid Waste Disposal in Essex County has been studying the solid waste problem for many years, but has been unable to implement a solid waste disposal facility because of site location problems.

It is clear from a review of State Solid Waste Management Legislation up to 1970, that primary responsibility for the provision of solid waste services was delegated to local municipal government. However, with increasingly complex solid waste management problems, such as increased solid waste generation, inadequate disposal facilities, and an emphasis on environmental aspects, it is apparent that most municipalities, acting alone, lack the jurisdictional scope and resources to provide efficient, effective and environmentally sound solid waste management facilities.

Hence, in 1970, the State Legislature, noting that it is the express objective of the Federal and State Governments to initiate and encourage regional solid waste disposal facilities, passed the "County Solid Waste Disposal Financing Law". The Law was the first major piece of legislation that identified the county as a solid waste disposal region. Basically, the law permits any county to float general obligation bonds to finance the purchase, construction or improvement of solid waste disposal facilities and to enter into contracts with municipalities, joint meetings, incinerator authorities, and private solid waste disposal companies for the use of its disposal facilities.

The county role in solid waste processing and disposal management was further identified by the <u>New Jersey State Solid Waste Management Plan</u>, published in July 1970, which recommended that the State's "... municipalities be joined together into Solid

Waste Management Districts ... (which) ... wherever possible ... should be contiguous with existing county governmental units".

Following the passage of the "County Solid Waste Disposal Financing Law", the "Municipal Utilities Authority Law" was supplemented to permit County Utilities Authorities to collect, treat and dispose solid waste materials. Recently, the "County Improvement Authorities Law" was amended to permit County Improvement Authorities to acquire, construct, maintain and operate solid waste management systems. Table VI-3 lists selected statutes which affect solid waste management at the county level of government.

The county, as a middle level of government, appears to be the next logical unit of government to coordinate, plan and develop regional solid waste processing and disposal facilities, since:

- the county generally has a wider choice of potential sites for a solid waste facility than a single municipality;
- economies of scale can be achieved in administrative, design, construction, operating and planning costs over a larger operating base;
- the county is an existing unit of government with the requisite powers to implement a regional solid waste management system;
- coordination of pollution monitoring and abatement activities would be enhanced by a regional facility rather than a large number of smaller municipal and privately-operated facilities;
- the county has a broader tax base from which to raise revenues for the implementation of a regional solid waste management system; and

TABLE VI-3

NEW JERSEY STATUTES CONCERNING SOLID WASTE MANAGEMENT AT THE COUNTY LEVEL

| TITLE | DESCRIPTION OF STATUTE |
|---|---|
| N.J.S.A. 26:11-10 | Enumeration of general power and duties of County Board of Health, including regulation and control over garbage and dumping of garbage. |
| N.J.S.A. 40:14B-70 Amendment to the Municipal Utilities Authorities Law | In any county where the Board of Chosen Freeholders have established a municipal utilities authority, the Board, by resolution, may authorize the Authority to collect, treat, and dispose of solid waste in accordance with the "County Solid Waste Disposal Financing Law".<br><br>The powers of the County Municipal Utilities Authority are vested in five Authority members appointed for five-year terms by the Board of Chosen Freeholders. The Authority is empowered to: acquire, construct and operate solid waste processing and disposal facilities; issue revenue bonds; levy service charges; make and enforce rules and regulations concerning the operation of the facility; and acquire property by gift, grant, purchase, or condemnation. |
| N.J.S.A. 40:37A-45 Amendment to County Improvement Authorities Law | Act amends and supplements the "County Improvement Authorities Law" (P.L. 1960, C. 183) to permit County Improvement Authorities to acquire, construct, maintain and operate solid waste systems for the purpose of collecting and disposing solid waste materials. The Improvement Authority may contract with municipalities for the use of its facilities. |

TABLE VI-3, CONTINUED

NEW JERSEY STATUTES CONCERNING SOLID WASTE MANAGEMENT AT THE COUNTY LEVEL

| TITLE | DESCRIPTION OF STATUTE |
|---|---|
| N.J.S.A. 40:37C-1 et.seq. New Jersey Industrial Pollution Control Financing Law | Any county may create an Authority for the purpose of acquiring, constructing, improving, operating, etc., of industrial pollution control facilities within such county, subject to approval of such facilities by the Department of Environmental Protection.<br><br>The Industrial Pollution Control Financing Authority shall consist of five members appointed by resolution by the Board of Chosen Freeholders of the county. Authority members shall serve for five years.<br><br>The Authority is empowered to acquire and operate pollution control facilities, and to lease, contract, sell, purchase, such facilities. The Authority is empowered to issue revenue bonds to finance the industrial pollution control facilities. Industrial firms may contract with the Authority in order to obtain funds for pollution control projects at favorable interest rates. |
| N.J.S.A. 40:66A-31.1 et.seq. "County Solid Waste Disposal Financing Law" | Permits any county to purchase, construct, improve, or enlarge solid waste disposal facilities within said county either alone or jointly with any municipality, joint meeting or incinerator authority within the county.<br><br>The county may provide and furnish its services to any municipality within the county.<br><br>Counties are permitted to float general obligation bonds to finance any solid waste facility and to fix and collect rates and fees for services provided. |

TABLE VI-3, CONTINUED

NEW JERSEY STATUTES CONCERNING SOLID WASTE MANAGEMENT AT THE COUNTY LEVEL

| TITLE | DESCRIPTION OF STATUTE |
|---|---|
| "County Solid Waste Disposal Financing Law", Continued | Counties may acquire by gift, grant, purchase, or by exercise of the right of eminent domain, any land within the county. Land owned by any governmental unit cannot be acquired without its express consent. |
| | Counties may enter into contracts with any government, corporation, or individual for the furnishing of disposal facilities, either by or to the county. |
| | The resolution of the Board of Chosen Freeholders to exercise the powers delegated to it in this statute must be submitted to the Commissioner of the N.J.D.E.P. The county is required to make any studies, borings, plans, drawings, etc., which the commissioner deems necessary. No county can proceed to exercise the powers of this statute without the Commissioner's approval. |
| | Counties may enter into contracts with municipalities, within or adjoining the county, joint meetings, incinerator authorities, and, on uniform terms, with all private solid waste collection and disposal companies for the use of its disposal facilities. |
| | Counties can assume entire cost either entirely by itself or share the costs with other participating governing bodies. |

- the county level of government has been identified in the official State Solid Waste Management Plan as the regional solid waste management district.

## THE STATE'S ROLE IN SOLID WASTE MANAGEMENT AND DISPOSAL

Prior to April 1970, the New Jersey Department of Health (DOH) was responsible for regulating the health and environmental aspects of solid waste management. In a major reorganization of the executive branch of state government in April 1970, a new department, the Department of Environmental Protection (DEP), was created and the solid waste functions, formerly under the jurisdiction of DOH, were assumed by the Bureau of Solid Waste Management within the Department of Environmental Protection.

Under legislation enacted in 1970, the New Jersey Department of Environmental Protection and the Public Utilities Commission were granted broad powers relating to the management of solid waste collection, processing, and disposal. The "Solid Waste Management Act of 1970" delegates to DEP the responsibility: 1) of enforcing the State Sanitary Code; 2) of undertaking a research and development program to determine "the most efficient, sanitary, and economical way of collecting, disposing, and utilizing solid waste"; 3) to develop a state-wide solid waste management plan; 4) to encourage the development of regional and county solid waste management plans; and 5) to demonstrate new collection and disposal methods. Finally, the Act requires that all individuals and firms engaged in the collection and disposal of solid wastes register with the DEP.

Another major piece of legislation which has a significant impact on solid waste management is the "Solid Waste Utility Control Act: of 1970. The Act gave the following powers and responsibilities to the New Jersey Public Utilities Commission:

- to establish qualifications based on experience, training, or education for all individuals and companies engaged in solid waste collection and disposal;
- to issue certificates of public convenience and necessity to those individuals found to be qualified to engage in solid waste activities;
- to regulate rates and fees, upon a finding of excessive and unreasonable rates, to require that appropriate adjustments be made in rate structures;
- to revoke certificates of public convenience and necessity for:
    a. violation of P.U.C. rules and regulations,
    b. violation of any rules and regulations relating to the protection of the environment, or
    c. refusal to comply with any lawful order of the P.U.C., and
- to ensure that no solid waste collection or disposal utility is permitted to limit bidding, withdraw from a specific territory, or endeavor to eliminate competition;
- to designate specific franchise areas for collection and disposal.

While primary responsibility for solid waste management at the state level resides with the DEP and PUC, several other state departments, including the Department of Agriculture and the

Department of Health, play a limited role. The New Jersey Department of Agriculture is permitted to license and regulate garbage-feeding hog farms and to conduct periodic inspections and examinations of the garbage-feeding operations. There are approximately 150 farms in the State that are presently licensed to feed garbage to hogs.

Under N.J.S.A. Title 26, the New Jersey Department of Health is delegated the responsibility of protecting the health and welfare of the general public. However, with the creation of the DEP, the State Health Department's involvement in solid waste management has been essentially transferred to DEP.

Table VI-4 lists some of the New Jersey Statutes defining state powers and regulations in the field of solid waste management.

Presently, the State does not have a grant program available to county and municipal governments for the construction of solid waste processing and disposal facilities.

## THE FEDERAL ROLE IN SOLID WASTE MANAGEMENT

At the Federal level, the main laws concerning solid waste management are the Solid Waste Disposal Act of 1965 and the Resource Recovery Act of 1970 which amended the original law. The Resource Recovery Act outlines the Federal role in solid waste management, which includes:

## TABLE VI-4

### SELECTED NEW JERSEY STATUTES CONCERNING STATE POWERS AND REGULATIONS IN SOLID WASTE MANAGEMENT

| TITLE | DESCRIPTION OF STATUTE |
|---|---|
| N.J.S.A. 2A:170-33 | Any person who unlawfully dumps refuse, garbage or debris, etc., on private property is a disorderly person. |
| N.J.S.A. 2A:170-67.1 | Any person who unlawfully dumps refuse, paper, trash, garbage, etc., on a highway or public lands is a disorderly person. |
| N.J.S.A. 4:5-106.1 | New Jersey Department of Agriculture empowered to license and regulate garbage-feeding hog farms and to conduct periodic inspections and examinations. Regulations include the satisfactory treatment of garbage before feeding farms or the importation of garbage for that purpose. |
| N.J.S.A. 13:9-23 | Any person who permits or establishes any dump or area for disposal of rubbish, debris, or waste of any nature, which facilitates the origin or spread of forest fires shall be deemed to have created a fire hazard and a public nuisance. |
| N.J.S.A. 13:1E et.seq., "Solid Waste Management Act of 1970" | The New Jersey Solid Waste Management Act of 1970 gives broad powers to the State Department of Environmental Protection. The Department is mandated, among other things, to:<br>1) supervise solid waste collection and disposal facilities and operations;<br>2) undertake a program of research and development for the purpose of determining the most efficient, sanitary and economical way of collecting, disposing and utilizing solid waste; |

TABLE VI-4, CONTINUED

SELECTED NEW JERSEY STATUTES CONCERNING

STATE POWERS AND REGULATIONS IN SOLID

WASTE MANAGEMENT

| TITLE | DESCRIPTION OF STATUTE |
|---|---|
| "Solid Waste Management Act of 1970", Continued | 3) formulate and promulgate, amend and repeal codes, rules and regulations concerning solid waste collection and disposal activities; |
| | 4) develop and formulate a State-wide solid waste management plan and guidelines to implement the plan, and to encourage and assist in the development and formulation of regional, County, and inter-County solid waste management plans and guidelines to implement the plans; |
| | 5) acquire, by purchase, grant, contract or condemnation, title to real property, for the purpose of demonstrating new methods and techniques for the collection, disposal, and utilization of solid waste; |
| | 6) purchase, operate and maintain any facility, site, laboratory equipment or machinery necessary to the performance of its duties pursuant to the Act; |
| | 7) apply for, receive, and expend funds from any public or private source; |
| | 8) contract with any other public agency or corporation incorporated under the laws of this or any other state for the performance of any function under this Act; |
| | 9) construct and operate, on an experimental basis, incinerators or other facilities for the disposal or utilization of solid waste and provide |

TABLE VI-4, CONTINUED

SELECTED NEW JERSEY STATUTES CONCERNING

STATE POWERS AND REGULATIONS IN SOLID

WASTE MANAGEMENT

| TITLE | DESCRIPTION OF STATUTE |
|---|---|
| "Solid Waste Management Act of 1970", Continued | the various local governments and State agencies with statistical data on costs and methods of solid waste collection and disposal<br><br>10) an amendment to the original Act provides that no ordinances or regulations of any governing body of a municipality, county or Board of Health more stringent than the Solid Waste Management Act of 1970 or any rules or regulations promulgated pursuant thereto, and relating to the health and environmental aspects of solid waste management, shall be superseded by the Act |
| N.J.S.A. 13;1I-1 et.seq., "Waste Control Act" | An Act empowering the Commissioner of the Department of Environmental Protection to to promulgate rules and regulations prohibiting, conditioning, and controlling the incineration and for landfilling of solid wastes and the treatment and disposal of liquid wastes, within the State of New Jersey, which originated and were collected outside of the State. This Act currently is being tested in the Courts. The Act was struck down in the Courts and is currently under appeal by the State of New Jersey. |
| N.J.S.A. Title 26 | New Jersey Department of Health empowered to protect the health and welfare of the public and to establish a State Sanitary Code to achieve this end. With the creation of the Department of Environmental Protection in April 1970, most of the solid waste regulation and control functions were transferred from the Department of Health to the DEP |

TABLE VI-4, CONTINUED

SELECTED NEW JERSEY STATUTES CONCERNING STATE POWERS AND REGULATIONS IN SOLID WASTE MANAGEMENT

| TITLE | DESCRIPTION OF STATUTE |
|---|---|
| N.J.S.A. 27:5E et.seq. | Act describes State powers in regulation of junkyards adjacent to primary highways. |
| N.J.S.A. 48:13A-1 et.seq. "Solid Waste Utility Control Act of 1970" | Solid waste collection and disposal declared a public utility and the P.U.C. empowered to regulate its economic aspects: Powers include the following:<br><br>1) To establish qualifications based on experience, training, or education for all individuals engaged in solid waste collection and disposal;<br><br>2) To issue certificates of public convenience and necessity to those individuals found to be qualified to engage in solid waste activities;<br><br>3) To require that performance bonds be posted by every individual engaged in the solid waste business;<br><br>4) To designate specific franchise areas for collection and disposal;<br><br>5) To regulate rates and, upon finding of excessive and unreasonable rates, to require that appropriate adjustments be made in rate structures;<br><br>6) To revoke certificate of public convenience and necessity for:<br><br>a) violation of PUC rules and regulations<br><br>b) violation of any rules and regulations relating to the protection of the environment, or<br><br>c) refusal to comply with any |

TABLE VI-4, CONTINUED

SELECTED NEW JERSEY STATUTES CONCERNING STATE POWERS AND REGULATIONS IN SOLID WASTE MANAGEMENT

| TITLE | DESCRIPTION OF STATUTE |
|---|---|
| "Solid Waste Utility Control Act of 1970", Continued | lawful order of the PUC<br>7) To ensure that no solid waste collection or disposal utility is permitted to limit bidding, withdraw from a specific territory, or endeavor to eliminate competition |

- research, demonstration and training programs,
- special studies and demonstration projects in the recovery of useful energy and materials,
- encouragement of regional cooperation and the enactment of uniform state and local laws governing solid waste disposal,
- grants to state and local planning agencies to develop solid waste management plans,
- grants to state and local governments for the demonstration of resource recovery systems and improved solid waste disposal facilities, and
- development of a comprehensive report and plan for the creation of a system of national disposal sites for the storage and disposal of hazardous wastes, including radioactive, toxic chemical, biological, and other wastes which may endanger public health.

The Federal Solid Waste Management Program is administered through ten regional offices serving the fifty states and U. S. possessions. EPA's Region II office, which includes New Jersey, New York, Puerto Rico and the Virgin Islands, is located at 26 Federal Plaza in New York City. The regional office serves as a liaison between state and local governments and the Federal Solid Waste Program, providing general information and planning and technical assistance.

Since the passage of the Federal Solid Waste Legislation, the Federal EPA has funded a number of planning and demonstration projects. Because of current budget cutbacks in 1974 and 1975, these programs have been essentially curtailed. While local communities may qualify to receive federal grants to assist them in the construction of wastewater treatment facilities, similar grants are not available from the Federal Government for the construction of solid waste processing and disposal facilities. This federal policy points to the necessity of increased county activity in the development of solid waste management systems.

## CRITERIA FOR REGIONAL OR COUNTY-WIDE SOLID WASTE ADMINISTRATIVE SYSTEMS

This discussion of criteria for evaluation of regional or county-wide solid waste management administrative systems assumes that the technical solutions developed will be engineered to meet all existing and anticipated health and environmental standards and regulations. The discussion is, therefore, concerned with the ability of the administrative structure, i.e., county department, authority, joint meeting, etc., to plan, develop, finance, and operate these technical solutions within acceptable political and legal bounds. The following criteria should be considered in evaluating regional or county-wide administrative systems for solid waste disposal:

A. Financial Capabilities. While there are differences between the various technical alternatives for solid waste management in terms of capital, operation and maintenance, and replacement costs, the administrative structure must have the resources to meet these costs. Construction, operation, maintenance, and replacement costs for solid waste processing and disposal facilities do not, at present, qualify for Federal or State funding.

According to EPA officials, the Federal Solid Waste Management Program does not anticipate the sort of federal funding such as is available in the water quality area, where combined federal and state grants may account for as much as 90 percent of the costs of constructing sewers, interceptors and sewage treatment facilities. Thus, the costs of implementing regional solid waste management systems will fall most heavily on counties, municipalities and/or authorities.

There are several alternative methods of financing the purchase or construction of solid waste facilities. All methods are not necessarily allowed under the law in each type of administrate structure. Table VI-5 lists these financing methods.

First, an administrative structure may decide to pay for such facilities out of current revenues, including revenue sharing, thus avoiding incurring any debt and any additional interest or debt service expenditures. An advantage of the "pay-as-you-go" plan is that, by holding down debt obligations, credit is conserved for other future needs. The disadvantages of financing solid waste facilities, out of current revenues, are: 1) the community may be deprived of essential solid waste services needed immediately, while sufficient capital is accumulated to pay for the facilities, 2) current taxpayers pay for solid waste facilities which benefit future users, thus, costs are not always equally distributed, and 3) savings on interest and debt service costs may be lost while waiting to accumulate

TABLE VI-5

SUMMARY OF ALTERNATIVE FINANCING METHODS FOR CAPITAL CONSTRUCTION OF SOLID WASTE SYSTEMS IN OCEAN COUNTY

| TYPE OF FINANCING METHOD | DESCRIPTION | ADVANTAGES | DISADVANTAGES |
|---|---|---|---|
| Appropriations from Tax Base | County would fund projects by yearly appropriations funded by taxes | Least expensive method of financing capital improvements. No bond or lease interest charges | Results in tax rate increases. Large capital expenditures must be deferred until appropriations are accumulated |
| General Obligation Bonds | Issued by the County and secured by taxing authority | Generally have a low interest rate. Commonly used for long-term projects with large capital requirements | Total bonded indebtedness is limited, based on tax base |
| Lease | Private investor builds facility and leases it to County. County repays initial costs plus interest | Lease purchase arrangements can be worked out. Lease offers flexibility in turnkey construction, start-up, and management of solid waste facility | Lease arrangement generally has highest interest cost, compared to bonds |
| Revenue Bonds | Bonds issued by authority. Revenue bonds are secured by the revenue source, and not by tax base | Revenue bonds do not count as part of County's statutory bonded indebtedness. Users of facility pay for costs | Interest rate is higher than rate for General Obligation Bonds |

TABLE VI-5, CONTINUED

SUMMARY OF ALTERNATIVE FINANCING METHODS FOR CAPITAL CONSTRUCTION OF SOLID WASTE SYSTEMS IN OCEAN COUNTY

| TYPE OF FINANCING METHOD | DESCRIPTION | ADVANTAGES | DISADVANTAGES |
|---|---|---|---|
| Revenue Sharing Funds | Use of Federal revenue sharing funds for capital requirements | No interest charges for bonds or lease. Large capital sums may be available. No tax rate increase | Limited to magnitude of available county revenue sharing funds. Revenue sharing funds may be already committed for other purposes |

sufficient funds to pay for the facility because of the inflation of construction and equipment costs which have been increasing at the rate of over 12 per cent per year.

A second financing alternative is to provide for the issuance of general obligation bonds to finance the purchase or construction of solid waste facilities. General obligation bonds place the so-called "full faith and credit" of the county behind the promise to repay the debt. The bond holders are assured that the county has the power to level ad valorem taxes without limit until the entire debt is repaid. Thus, general obligation bonds appeal to investors because of their relative security and because the interest received is exempt from the Federal income tax. The Board may also pledge all or any part of the revenues derived by the county from the operation of the solid waste facility to repay the debt service. However, since all direct debt of local governments must be issued as general obligation bonds, a county is prohibited from issuing revenue bonds which are secured entirely by the fees, charges, and other earnings of the project.

Another financing alternative is a lease agreement where the leasing company purchases and holds title to the equipment during the term of the lease. The lessee (the county, for example) pays rentals for the use of the equipment over a specified period. In solid waste management, lease agreements are usually arranged by local equipment representatives who place the financing with either a bank or leasing company.

The use of leasing for financing solid waste equipment has been limited because of the higher interest rates compared to general obligation bonds or revenue bonds.

Authorities are permitted to float revenue bonds to finance the construction or acquisition of solid waste treatment and disposal facilities. Revenue bonds are obligations to finance self-supporting facilities. The bonds are secured solely by the fees, charges, and other earnings of the solid waste facility. Should these earnings prove inadequate to meet debt expenses, the sole remedy for the bond holders is a readjustment in the fees and other user charges to cover debt obligations.

There are two important advantages to revenue bonds: 1) revenue bonds are based on the concept that only the users of the solid waste facilities financed by the bond pay for the facilities through user charges imposed by the authority, and 2) revenue bonds are not subject to statutory debt limits since they are not considered to be a county debt. The major disadvantages to revenue bond financing is that debt service charges are usually higher than those for general obligation bonds since the latter are deemed more secure because they are backed by the full faith and credit of the governmental unit selling the bonds.

Another financing alternative is to contract with a private firm to raise the capital, purchase the equipment, and operate a solid waste disposal system. This approach relieves the county of devoting capital funds for solid waste treatment and the commitment exists only for the length of the signed contractual agreement. It should be noted, however, that in order for the private firm to recover its capital investment, a relatively long-term contract may be required. Since the private firm must make a profit on its efforts and pays higher interest rates for its operating and capital monies, the cost of such financing is much higher than other alternative methods.

B. <u>Regionalism</u>. In general, the larger the population serviced, the lower are the unit costs of operating a regional solid waste disposal facility. This is due to a number of factors, including lower administrative costs, relatively lower maintenance costs, lower unit costs for capital construction, etc.

The concept of regionalism is advocated by the State. The "New Jersey State Solid Waste Management Plan" identifies the county as the basic planning and operational unit for the treatment and disposal of solid waste. In passing the "Solid Waste Management Act of 1970," the legislature concluded that the current solid waste crisis should be resolved not only by the enforcement of more stringent and realistic regulations upon the solid waste industry, but also through the development and formulation of State-wide, regional, county, and intercounty plans for solid waste management and guidelines to implement the plans.

<u>Thus, the administrative structure selected should service a population sufficient to reduce the unit costs of solid waste treatment, and to plan, develop, and operate on a county-wide or regional basis</u>.

C. <u>Ability to Acquire Land</u>. The third criteria, and in many ways the most crucial factor, is the ability of the management structure to acquire and utilize land for the solid waste facility. Under existing State law (N.J.S.A.

20:1-1, et. seq.), State, county, and municipal governments, if unable to acquire land by agreement with the owner(s), may acquire land for valid purposes by petitioning the Supreme Court to appoint a three-member Commission to fix a reasonable compensation to be paid to the owner(s) for the land. Commissioners must be residents of the county in which the land is located and their report and recommendations are to be filed with the Court. The Court then determines whether the government can exercise its power of eminent domain.

Generally, local opposition to a proposed site prevents most solid waste facilities in New Jersey from being implemented. The local residents generally agree with the overall concept of regional development, however, they generally want the facility to be located elsewhere than in their municipality.

Acreage requirements will vary based upon the technical alternatives considered and other factors, including generation rates, projected or anticipated useful life of the facility, etc. In general terms, for the Ocean County area a regional landfill would require 150 to 300 acres or more; a resource recovery processing facility about 10 acres; a transfer station about 5 acres. These figures would have to be modified, of course, based on site conditions, required buffering, anticipated waste quantities, etc.

In summary, the ability of the administrative structure to acquire property for a solid waste facility from a legal standpoint is not difficult. However, a major problem which must be overcome is the negative attitutes the general public has toward solid waste facilities, and, in particular, any proposal to locate the facility in their community.

D. Ability to Control Wastes Entering System. The solid waste disposal system selected and its design capacity will establish limits to the amounts and types of wastes that can be satisfactorily accepted. Therefore, in order to plan and effectively utilize the solid waste facility, the administrative structure should have control over the sources, types, and quantities of solid wastes that are discharged into the processing and disposal system.

A major problem which might arise in this area comes from another statute, the "Solid Waste Utility Control Act of 1970" (N.J.S.A. 13:1E-1 et. seq.), which empowers the New Jersey Public Utilities Commission (P.U.C.) to regulate the rates and public utility aspects of the solid waste collection and disposal industry. The P.U.C. has interpreted this mandate very broadly to include not only private solid waste collection and disposal operators, but public (municipal and county) operations as well. This interpretation was upheld in a New Jersey Superior Court decision rendered on December 2, 1971 (117 N.J. Super. 304). The Court "... held that, where county-owned solid waste disposal facilities serviced not only municipalities within boundaries of (the) county, but private scavengers (contractors) and private residents, the operation of the facilities by the county, including rates charged for the use of the services, were subject to regulation by the Board of Public Utility Commissioners; the county, operating and managing its landfill sited, was (a) 'public utility', subject to the rate regulatory powers of the Board".

The decision further stated that "... the fact that a county-owned landfill site is used should not deprive the public of the protection provided by the Board's (P.U.C.) regulatory powers. To hold otherwise would undermine the Board's ability to fulfill its duty as charged by the Legislature of 'setting forth and enforcing standards and rates for regulating (the) economic aspects of solid waste collection, disposal and utilization service' ...".

The P.U.C. has taken the position that, once a publicly-operated solid waste facility is opened to private solid waste contractors and private citizens for their use at a specified rate or fee, then the facility is considered a public utility which can be utilized by any private contractor or citizen in the State. The implication of this position is that the operator of the facility, once it is opened to a number of private contractors or private citizens, has no control over the amount, type and source of wastes entering the solid waste facility because any private contractor or private citizen may utilize the facility whenever he wishes. Thus, certain design capacities (projected useful life of the facility, capacity of the system to accept and effectively process wastes, etc.) may be reached or even surpassed by the uncontrolled and unlimited use of the facility. This could result in the overtaxing of equipment and the accumulation of untreated wastes resulting in breakdowns and environmental and health problems.

There are several ways of avoiding this problem. First, the administrative structure may limit the use of the solid waste facility to only those wastes that are generated within the county. In other words, the facility's use would be limited to the county's municipalities, private contractors contracted either by residents of the county, or by public agencies (municipalities, the county joint meetings, authorities, school boards, etc.), or by county residents themselves. (Rates charged by the county for use of the facility would still be subject to P.U.C. for a restriction of use permit. Such a permit would, in all likelihood, be granted if the county could show that the unlimited (or uncontrolled) use of the facility would exceed design capacities and that the county, in limiting the use of the facility, used reasonable and justifiable criteria for determining who would and who would not be permitted to use the facility. Lastly, the Board could petition the State Legislature to enact legislation that would permit the county to control and regulate, in a reasonable manner, the types and quantities of wastes entering the treatment facility.

E. Management Capabilities. The administrative structure should have the in-house or consultant resources to consider and incorporate into the existing system new technology that would affect the processing of solid waste. Similarly, the administrative structure must have the capability of evaluating the existing system and continually upgrading the operation to insure that health and environmental standards are being met.

The difference between a good operation and a poor one in many cases is related to the quality of the personnel that are directly involved in the day-to-day operations of the facility. In order to attract and keep qualified personnel, the administrative structure should provide adequate salaries and fringe benefits. Also, the manager or supervisor of the facility and other key personnel should have experience and educational background commensurate with their responsibilities.

## ALTERNATIVE SOLID WASTE ADMINISTRATIVE STRUCTURES FOR OCEAN COUNTY

Table VI-6 lists a number of important concepts relating to the current legislative basis of available administrative structures. At present, there are four major State Statutes which regulate and permit county-wide administrative structure for solid waste management: 1) County Solid Waste Disposal Financing Law, 2) County Municipal Utilities Authority Law, 3) County Improvement Authorities Law, amended, and 4) The

TABLE VI-6

ALTERNATIVE REGIONAL ADMINISTRATIVE SYSTEMS FOR SOLID WASTE DISPOSAL FACILITIES IN OCEAN COUNTY

| LEGISLATIVE BASIS | TYPE OF REGIONAL SOLID WASTE SYSTEMS PERMITTED | ADMINISTRATIVE DIRECTION OF SYSTEM | TYPE OF FINANCING PERMITTED |
|---|---|---|---|
| County Solid Waste Disposal Financing Law | County Department, Contract with one or more municipalities, Contract with private company | Board of Chosen Freeholders | General Obligation Bonds, Yearly Appropriations, Revenue Sharing, Lease, Grants |
| County Municipal Utilities Authority Law | County Utilities Authority established by Freeholders | 5 Authority members appointed by Freeholders | Revenue Bonds, Direct Purchase from Income, Lease, Grants |
| County Improvement Authorities Law | County Improvement Authority established by Freeholders | 5 Authority members appointed by Freeholders | Revenue Bonds, Direct Purchase from Income, Lease, Grants |
| Industrial Pollution Control Financing Law | Industrial Pollution Control Financing Authority established by Freeholders | 5 Authority members appointed by Freeholders | Revenue Bonds, Direct Purchase from Income, Lease, Grants |

TABLE VI-6, CONTINUED

ALTERNATIVE REGIONAL ADMINISTRATIVE SYSTEMS FOR SOLID WASTE DISPOSAL FACILITIES IN OCEAN COUNTY

| LEGISLATIVE BASIS | TYPE OF REGIONAL SOLID WASTE SYSTEMS PERMITTED | ADMINISTRATIVE DIRECTION OF SYSTEM | TYPE OF FINANCING PERMITTED |
|---|---|---|---|
| Incinerator Authorities Law of 1948 | One or more municipalities may create Incinerator Authority | 5 appointed Authority members if one municipality; One member appointed from each municipality if multi-municipalities in Authority | Revenue Bonds, Direct Purchase from Income, Lease, Grants |
| Solid Waste Management Authorities Law of 1968 | One or more municipalities may create Solid Waste Management Authority | 5 appointed Authority members if one municipality; One member appointed from each municipality if multi-municipalities in Authority | Revenue Bonds, Direct Purchase from Income, Lease, Grants |
| Consolidated Municipal Services Act (40:48B-1) | Joint Meeting between two or more municipalities | One member appointed by each municipality | Appropriations from member municipalities; Direct Purchase from Income, Lease, Grants |

Industrial Pollution Control Financing Law. On a multi-municipal basis there are three major State Statutes concerning solid waste management: 1) Incinerator Authorities Law of 1948, 2) Solid Waste Management Authorities Law of 1968, and 3) The Consolidated Municipal Services Act. Table VI-7 presents some of the operational aspects of all seven alternative regional administrative systems.

## TABLE VI-7

## OPERATIONAL ASPECTS OF ALTERNATIVE REGIONAL ADMINISTRATIVE SYSTEMS FOR SOLID WASTE DISPOSAL FACILITIES IN OCEAN COUNTY

| LEGISLATIVE BASIS | SCOPE OF REGIONAL SYSTEM | CONTROL OF SOLID WASTES ENTERING SYSTEM | FACILITY SELECTION AND ACQUISITION |
|---|---|---|---|
| County Solid Waste Disposal Financing Law | County may contract with local governing bodies and private firms, both within and adjoining the county, for use of its solid waste facility. Regional service area is defined by contracts | Through its contractual powers and a limited-use permit issued by the PUC, the county can control the amount and type of wastes entering system | County may acquire land by gift, purchase, lease, or eminent domain. New Jersey Department of Environmental Protection must approve facility plans and site |
| County Municipal Utilities Authority Law | Service area is defined by participating municipalities and user agreements | Control is through contracts and user agreements | Authority may acquire property by gift, grant, purchase, lease or condemnation. New Jersey Department of Environmental Protection must approve of facility plans and site |
| County Improvement Authorities Law | Service area is defined by participating municipalities and user agreements | Control is through contracts and user agreements | Authority may acquire property by gift, purchase, lease, or condemnation. Site selection requires approval of New Jersey DEP, municipalities representing 75% of population, and County Planning Board |

TABLE VI-7, CONTINUED

OPERATIONAL ASPECTS OF ALTERNATIVE REGIONAL ADMINISTRATIVE SYSTEMS FOR SOLID WASTE DISPOSAL FACILITIES IN OCEAN COUNTY

| LEGISLATIVE BASIS | SCOPE OF REGIONAL SYSTEM | CONTROL OF SOLID WASTES ENTERING SYSTEM | FACILITY SELECTION AND ACQUISITION |
|---|---|---|---|
| Industrial Pollution Control Financing Law | Industrial firms within county area | Control is through contracts with industrial firms | Authority may acquire property by gift, purchase, or lease. Facilities must be approved by N. J. Dept. of Environmental Protection |
| Incinerator Authorities Law of 1948 | Service area is defined by municipalities who become members of Authority. Authority may provide contract service to other non-member municipalities | Through contracts, Authority may control wastes entering system | Authority may acquire land within or without district by gift, purchase, lease, or condemnation. New Jersey Department of Environmental Protection must approve facility plans and site. All member municipalities must approve |
| Solid Waste Management Authorities Law of 1968 | Service area is defined by municipalities who become members of Authority. Authority may provide contract services to other non-member municipalities | Through contracts, Authority may control wastes entering system | Authority may acquire property within district by condemnation, purchase, or gift. All member municipalities must approve of site location. N.J.D.E.P. must approve facility plans and site |

TABLE VI-7, CONTINUED

OPERATIONAL ASPECTS OF ALTERNATIVE REGIONAL ADMINISTRATIVE SYSTEMS FOR SOLID WASTE DISPOSAL FACILITIES IN OCEAN COUNTY

| LEGISLATIVE BASIS | SCOPE OF REGIONAL SYSTEM | CONTROL OF SOLID WASTES ENTERING SYSTEM | FACILITY SELECTION AND ACQUISITION |
|---|---|---|---|
| Consolidated Municipal Services Act (40:48B-1) | Region is limited to Joint Meeting member municipalities and non-member communities under contract | Control of wastes entering system by contracts | Joint Meeting may acquire property by purchase, gift, lease, or condemnation. All members of Joint Meeting must approve of site. N.J.D.E.P. must approve of facility plans and site |

## VII. REVIEW OF NEW JERSEY MARKETS FOR MATERIALS RECOVERED FROM MUNICIPAL SOLID WASTE IN OCEAN COUNTY

### INTRODUCTION

An important aspect of solid waste management involves reducing the ever-increasing volume of solid waste that is discarded each day for disposal. At a time of shortages of fuel and natural resources, increased attention has been focused on the recovery of valuable resources from a generally untapped supply - discarded solid waste. According to a 1974 Environmental Protection Agency report to Congress entitled "Resource Recovery and Source Reduction," the energy equivalent of 400,000 to 500,000 barrels of oil per day (1% of total U.S. daily energy consumption) could be recovered from municipal solid waste. Reportedly, 7 percent of the iron, 8 percent of the aluminum, 20 percent of the tin, and 14 percent of the paper consumed annually in the United States could be supplied from solid waste. Generally, it requires less energy to re-manufacture products from recycled materials than it does to manufacture the products from virgin supplies. For example, on a pound per pound basis, it has been estimated that only 5 percent as much energy is required to manufacture a ton of aluminum ingot from recycled aluminum scrap than from ore.

As virgin material prices are forced up by new environmental controls, the relative costs and benefits of recycled materials will increase. As disposal costs (incineration, landfill, etc.) rise, and in addition, as land for disposal becomes less available, the economics of recovery of materials through pre-disposal recycling will become more favorable. Thus, it appears that the trends of scarce supplies and higher procurement costs for virgin raw materials, coupled with escalating disposal costs will insure new emphasis on the utilization of solid waste as a supplemental energy and/or materials source. There are several state-of-the-art materials recovery systems being tested today. More refined systems will be developed and proven in the coming years. As the technology is developed to economically separate the recoverable materials from solid waste, a corresponding development of the markets for the recovered components must be initiated.

If widespread recovery of materials from solid waste and the subsequent development of markets to accept the material is to be successful, certain policies involving the transportation, taxation, and use of virgin and recycled materials must be reviewed. Some of the policies are detailed below:

- Discriminatory pricing practices which favor the transportation of virgin materials over the transportation of secondary materials must be changed to provide an incentive for use of recycled materials.
- Depletion allowances, capital gains treatment, and foreign tax credits must be revised to include secondary materials.
- Consumer conditioning by mass media advertising has taught the consumer that "newer is better." This has, in turn, decreased the demand for products with "used" or "salvaged" components.

Secondly, there are a number of obvious advantages that virgin materials hold over recycled materials.

- Virgin materials usually occur in concentrations. Materials recovered from mixed municipal solid waste are less desirable from a re-use standpoint because of their inter-mixing with other waste materials.

- Virgin materials are usually of known composition and quality. Materials from solid waste are contaminated with various oils, tars, dirts, etc.

- The costs to acquire virgin materials (usually because of discriminatory tax and transportation policies) very often are the same as the costs to acquire secondary materials. When a manufacturer has a choice between the two materials, virgin raw materials usually take precedent.

The acceptance of secondary materials as a substitute for virgin materials can be strengthened if some of the above-mentioned transportation, taxation and use practices are reviewed and altered.

THE SALVAGE INDUSTRY

The traditional link between the supply of secondary materials and the users of recycled materials has been the salvage industry. In 1967, the salvage industry represented 8,000 companies employing 79,000 people with sales of $4.6 billion. This industry handled 80 million tons of metals, paper, glass, textiles, and rubber. However, in the period from 1967 to 1973-1974, there have been major changes in the recycling picture. For example, in 1973, there were 60 million tons of iron and steel purchased for re-use alone. There has been a 75 percent increase in the price paid for aluminum. There has been a 100 percent increase in copper prices in the last six years. Lead prices have increased four-fold since 1971.

The salvage industry is comprised of several segments. Some of the industry subdivisions are described below:

> <u>Junkman or Collector</u>: The junkman is the smallest secondary materials operator. He usually collects recyclable materials from small commercial and industrial companies. His operation is marginally economical and his market is usually a larger salvage dealer.
>
> <u>Salvage Dealer</u>: Salvage dealers usually handle metals, paper, and textiles. The salvage dealer seldom enters into long range contracts with suppliers or markets. Usually there is no processing of the material except for some occasional sorting.
>
> <u>Dealer-Processor</u>: A dealer-processor is large enough to have processing equipment to upgrade the quality of the secondary materials. Usually, many small dealers will supply the dealer-processor and he in turn usually sells to manufacturers.
>
> <u>Broker</u>: A broker coordinates the purchasing and resale of the recyclable materials between dealers and a final manufacturer or market without actually handling the material. He is valuable in his knowledge of "where to buy" and "where to sell" various materials.
>
> <u>Social Service Agencies and Civic Groups</u>: This catagory is unusual because it bypasses all of the aforementioned middle-men and deals directly with a manufacturer. For example, glass or aluminum cans may be collected from a municipality through a collection drive and then delivered directly to the glass plant or aluminum company for recycling. The proceeds usually help the organization or group. Volunteer labor also aids in economic success. Most textiles discarded are collected by such Social Service Agencies and re-distributed for re-use.

As mentioned previously, the development of secure markets willing to accept recovered materials over a long time period is essential to continued expansion of resource recovery projects. Just providing an ample dependable supply of secondary materials (such as from a county reclamation facility) does <u>not</u> guarantee a market for the materials. The demand for recycled goods controls both the price and the supply. Occasionally, a dealer may not be able to meet the demand with his supplies and a month later he may find he has to turn off his supplies or stockpile supplies when demand subsides.

## CURRENT TRENDS AND DEVELOPMENTS IN THE SALVAGE INDUSTRY

The salvage industry essentially contains five types of operations: 1) acquisition, 2) concentration, 3) purification or separation, 4) reduction of shape or size, and 5) preparation for shipment. The degree of utilization of these steps depends on the material being recycled. The primary step involved in any salvage operation is sorting. Unfortunately, sorting is a labor intensive operation and labor costs are very high. Thus, in recent years, there has been a trend to centralization of the salvage industry. Smaller dealers and processors are merging in order to economically purchase equipment, reduce manual sorting, and upgrade their processing operations. An example of this occurs in the ferrous scrap industry. Due to increasing labor costs and recent technological advances such as the automobile shredder, small ferrous dealers are grouping together to purchase a shredder. Generally, a scrap dealer must have sales of over $500,000. annually to utilize an automobile shredder economically.

MARKETS FOR PAPER

Paper and paperboard, the largest single component of municipal solid waste, represent one of the major manufactured materials consumed in the United States. In 1972, the Nation consumed 63.8 million tons of paper and by 1980, consumption is expected to be upwards of 85.0 million tons. Per capita paper consumption is expected to increase about 45 percent from 575 pounds per year to 835 pounds per year. A substantial segment of the waste paper enters the solid waste stream. According to a study made in 1967, the Nation consumed 532 pounds of paper per person per year and discarded 420 pounds per person.

In recent years, there has been a relative decline in waste paper recovery compared to paper consumption. In the last decade, paper consumption increased 5.2 percent per year while during the same time, waste paper re-use only increased 1.2 percent per year. The increasing use of "disposable" paper products such as paper towels, tissues, disposable diapers, food packages, bags, etc., has increased solid waste quantities nationally. Products such as these are difficult to recycle. The Federal Food and Drug Administration, for instance, prohibits the re-use of any paper product that has come in direct contact with food for re-manufacture into a similar container. Very often, after initial use, disposable paper items are too contaminated for efficient or economical re-use.

There are other factors that have contributed to the decreased use of waste paper. Reportedly, the use of wood pulp is increasing three times faster than the rate of waste paper. For example, one of the major end-uses of paper stock, combination paperboard, has had small growth, 5 percent in ten years compared to 112 percent for solid wood pulpboard. Another factor which influences the virgin fiber/waste fiber balance is the number of mills constructed that rely heavily on virgin raw materials for their production input. Reportedly, about 25 percent of the pulp mills in the United States are committed to the use of virgin materials in their production process. These plants accept little, if any, waste paper as a production input. A ton of contaminated waste paper can damage many tons of finished paper. It can damage machinery and stop the production process. For these obvious reasons, many mills will pay higher prices for virgin raw materials to be assured of finer, more consistent quality raw material.

The use of paper stock has increased in the field of newsprint recycling and re-use. Garden State Paper, Garfield, New Jersey, utilizes a patented de-inking process which enables them, reportedly, to re-use 600 tons of waste paper in their production process each day.

Paper in municipal solid waste accounts for about 40 to 60 percent by weight of the refuse and about 70 percent by volume. Table VII-1 lists some percentages of paper found in municipal solid wastes. Residential paper wastes generally consist of

## TABLE VII-1

## TYPICAL PAPER CONTENT IN MUNICIPAL WASTES

| ORIGIN | PERCENT COMPOSITION BY WET WEIGHT |
|---|---|
| ATLANTA, GEORGIA* | 59 |
| CHICAGO, ILLINOIS* | 55 |
| CINCINNATI, OHIO* | 42 |
| PATERSON, NEW JERSEY* | 40 |
| HUNTERDON COUNTY, NEW JERSEY+ | 40 |
| SUMMIT, NEW JERSEY+ | 36 |
| MONMOUTH COUNTY, NEW JERSEY+ | 42 |

* EPA Data

\+ Component Analysis by M. Disko Associates, based on sampling of a small quantity of solid waste newspapers, magazines, food packages and other disposable items such as towels and tissues. Commercial paper wastes consist of mail, office paper, communications, and corrugated boxes and cartons. Once the paper from the residential, commercial, and industrial users enters the solid waste stream, it immediately loses its value as a source of recyclable input to a production process to make similar materials. In other words, after high grade paper, such as writing paper, is contaminated in the waste stream by picking up dirt, oil, water, garbage, etc., it can no longer be separated and re-used in the high grade paper production process. It can, however, be utilized in the manufacture of paper goods of lesser quality (paperboard, roof strips, paper bags, etc.). Also, after each successive recycling, the paper fibers shorten and lose strength. Thus, there are limits on how many times a product can be recycled.

The largest percentages of recycled waste paper are found in corrugated paper and newsprint. Obviously, these two materials can be collected and recycled in large quantities by residential and commercial users. Corrugated paper and newspaper are usually separated from the contaminants at the source and thus enjoy a high market value and a subsequent high recovery ratio.

Within the five state region including, New Jersey, New York, Pennsylvania, Massachusetts, and Connecticut, there are 144 paper mills, 83 paperboard mills, and 18 building paper and board mills. This five state region represents a substantial market for waste paper input. Of the 12 million tons of waste paper consumed in the United States in 1970, 2.8 million tons (23.3%) were consumed in New York, New Jersey and Pennsylvania. Because of the low value-per-ton and high transportation costs, the New Jersey markets for recycled paper are usually confined to the above-mentioned five-state region. Approximately 90 percent of the cost of waste paper recycling is consumed in the collection, transportation, and sorting of the waste paper stock. Waste paper processing is a labor intensive operation where mechanization has little applicability. Hence, as labor costs continue to rise, the waste paper industry is challenged by virgin raw materials and plastic substitutes.

Generally, waste paper prices are proportional to the demand for paper stock which, in turn, is controlled by such factors as paper stock import and export levels, demand for construction materials, the availability of virgin pulp, and the demand for combination paperboard. Paper stock supply and demand are not controllable. Demand is controlled by the paper mills that use paper stock as a raw input, however, the supply is independent of mill demands. Thus, periods of high supply and low demand, as well as periods of high demand and low supply are common.

Table VII-2 gives selected waste paper prices on the New York market as reported in the "Paper Trade Journal" and the "Journal of Commerce." Table VII-3 illustrates the variation of prices for

TABLE VII-2

COMPARISON OF WASTE PAPER PRICES IN THE NEW YORK MARKET

| ITEM | PRICE RANGE - DOLLARS PER TON | | |
|---|---|---|---|
| | JUNE 15, 1973* | JANUARY 11, 1974* | JANUARY 6, 1975** |
| No. 1 Mixed Paper | $ 2.00 - 11.00 | $ - 30.00 | $ 5.00 - 7.00 |
| No. 1 News | 6.00 - 16.00 | 25.00 - 30.00 | 26.00 - 27.00 |
| Overissue News (lg.) | 9.00 - 20.00 | - | 38.00 - 39.00 |
| Mill Wrappers | 2.00 - 8.00 | - 15.00 | - |
| Old Corrugated Containers | 18.00 - 28.00 | - 55.00 | 27.00 - 28.00 |
| Double Ld. Kr. Corr. Cuts | 50.00 - 60.00 | 70.00 - 75.00 | - |
| (Semi-Chem. Medium) | - 55.00 | - 80.00 | - |
| New Br. Kraft, Env. Cuts | 70.00 - | - | - |
| New Br. Kraft Bag Waste | | | |
| Printed | 60.00 - | - | - |
| Unprinted | 70.00 - | - | - |
| No. 1. Groundwood Shavings | - 22.50 | - 40.00 | - |
| White Newsblanks | 35.00 - 50.00 | 60.00 - 100.00 | - |
| No. 1 Soft White Shavings | 55.00 - 60.00 | 100.00 - | 90.00 - 95.00 |
| Super Soft White Shavings | 55.00 - 65.00 | 105.00 - | - |
| Hd. White Envelope Cuts | 125.00 - 135.00 | 185.00 - 190.00 | - |
| Col. Tab Cards | 62.50 - 80.00 | 80.00 - 130.00 | - |

TABLE VII-2, CONTINUED

COMPARISON OF WASTE PAPER PRICES IN THE NEW YORK MARKET

| ITEM | PRICE RANGE - DOLLARS PER TON | | |
|---|---|---|---|
| | JUNE 15, 1973* | JANUARY 11, 1974* | JANUARY 6, 1975** |
| Manila Tab Cards | $115.00 - 125.00 | $175.00 - 190.00 | $170.00 - 175.00 |
| No. 1 Col. Ledger | 35.00 - 45.00 | 80.00 - 90.00 | 60.00 - 70.00 |
| White Ledger | 50.00 - 70.00 | 75.00 - 100.00 | - |

SOURCE: * PAPER TRADE JOURNAL

** JOURNAL OF COMMERCE

Prices listed as F.O.B. New York

TABLE VII-3

PRICES OF WASTE PAPER

SELECTED MARKETS, JANUARY 11, 1974

| ITEM | PRICES $/TON | | | |
| --- | --- | --- | --- | --- |
| | NEW YORK | BOSTON | CHICAGO | LOS ANGELES |
| No. 1 Mixed Paper | $ / 30.00 | $ 25.00/ 31.00 | $ / 22.00 | $ 10.00/ 15.00 |
| No. 1 News | 25.00/ 30.00 | 30.00/ 35.00 | 18.00/ 28.00 | 23.00/ 27.00 |
| Mill Wrappers | / 15.00 | 12.00/ 14.00 | 3.00/ 13.00 | 15.00/ 20.00 |
| Old Corrugated Containers | / 55.00 | 45.00/ 50.00 | 40.00/ 45.00 | 40.00/ 44.00 |
| Double Ld. Kr. Corr. Cuts<br>(Semi-Chem. Medium) | 70.00/ 75.00<br>/ 80.00 | 70.00/ 75.00<br>75.00/ 80.00 | 60.00/ 65.00<br>55.00/ 70.00 | 56.00/ 61.00<br>52.50/ 57.50 |
| New Br. Kraft, Env. Cuts | --- / --- | 140.00/150.00 | 90.00/100.00 | 65.00/ 85.00 |
| New Br. Kr. Bag Waste Printed | --- / --- | 115.00/125.00 | 50.00/ 60.00 | 60.00/ 80.00 |
| New Br. Kr. Bag Waste Unprtd. | --- / --- | 130.00/135.00 | 55.00/ 65.00 | 82.50/ 92.50 |
| No. 1 Groundwood Shvs. | / 40.00 | 40.00/ 50.00 | 25.00/ 30.00 | 30.00/ 35.00 |
| White Newsblanks | 60.00/100.00 | 90.00/100.00 | 70.00/ 80.00 | 60.00/ 65.00 |
| No. 1 Soft White Shvs. | 100.00/ | 120.00/130.00 | 85.00/100.00 | --- / --- |
| Super Soft White Shvs. | 105.00/ | --- / --- | /105.00 | --- / --- |
| Hd. White Shvs. | 125.00/145.00 | 125.00/135.00 | 125.00/145.00 | 95.00/105.00 |
| Hd. White Env. Cuts | 185.00/190.00 | 205.00/215.00 | 155.00/165.00 | 120.00/150.00 |
| Col. Tab. Cards | 80.00/130.00 | 130.00/140.00 | 80.00/ 95.00 | --- / --- |

TABLE VII-3, CONTINUED

PRICES OF WASTE PAPER

SELECTED MARKETS, JANUARY 11, 1974

| ITEM | PRICES $/TON | | | |
|---|---|---|---|---|
| | NEW YORK | BOSTON | CHICAGO | LOS ANGELES |
| Manila Tab. Cards | $175.00/190.00 | $180.00/190.00 | $140.00/155.00 | $ --- / --- |
| No. 1 Col. Ledger | 80.00/ 90.00 | 75.00/ 82.00 | 40.00/ 50.00 | 50.00/ 55.00 |
| White Ledger | 75.00/100.00 | 105.00/110.00 | 65.00/ 80.00 | 65.00/ 75.00 |

SOURCE: Paper Trade Journal

Prices listed are January 11, 1974 mill prices, f.o.b. truck shipping point waste paper in four major markets. Currently, the waste paper market in the New Jersey, New York and Pennsylvania region is depressed. Mixed newspaper has fallen from $30.00 per ton in January 1974 to essentially no market conditions in January 1975.

MARKETS FOR FERROUS METALS

In the manufacturing of steel and iron products, two important raw materials are iron ore and ferrous scrap. Generally, ferrous scrap is classified into three groupings, "home," "prompt," and "obsolete" scrap.

Home scrap is a by-product of the steel making process. It is recycled back into the production process at the steel mill. Home scrap is the most desirable scrap input for the steel mills because it is of known quality, and transportation costs are minimal since the scrap is usually within the plant. The scrap may be in the form of rolling mill croppings, metallic spills, defective ingots, etc.

Prompt scrap is produced as the by-product of fabrication and milling operations by industrial operations. If the scrap is sorted at the source, the industrial manufacturers will receive a high price for it when it is returned to the steel mill because it is of known composition and quality.

Obsolete scrap comes from materials that have outlived their usefulness and are ready to be discarded or recycled. Some sources of obsolete scrap include railroad and automobile wreckers, building demolition, farms, and ship breaking, as well as oil field and refinery scrap, incinerator and dump salvage, housing repair, etc. Obsolete scrap is the least desirable because it is generally of unknown quality and composition and it is usually contaminated with non-metallic components. Ferrous scrap derived from municipal solid waste falls into the obsolete category. However, the steel industry has a high reliance on obsolete scrap as an input to its operations. It is estimated that between 30 and 40 percent of available obsolete scrap is recycled every year.

There are three types of steel furnaces utilizing ferrous scrap. Electric furnaces, which operate almost entirely on scrap, consume little pig iron, and are a good market for scrap. Unfortunately, only about 11.8 percent of total steel production in 1967 was contributed by electric furnances. Open Hearth furnaces and basic oxygen furnaces use greater quantities of pig iron than do electric furnances. For this reason, most open hearth and basic oxygen furnaces are integrated with blast furnaces so that they can receive molten pig iron. Because of technical limitations, open hearth furnaces are limited to a maximum input of 70 to 80 percent scrap, and basic oxygen furnaces to 50 to 60 percent scrap. The percentage can be increased in basic oxygen furnaces if the scrap is pre-heated first. That, however, would tend to increase steel costs unless a corresponding drop in scrap prices made it economical.

The total supply of scrap is generally larger than the demand for it. Where large quantities of scrap are available, it is usually recycled. The one exception is automobile bodies. Frequently, the storage of automobile bodies on land is more economical than hauling to a scrap dealer. The automobile metallics form a "reservoir" that is tapped when the demand for cheap scrap temporarily exceeds the supply. After demand subsides, the automobiles are stored again. The recent introduction of the automobile shredder has revolutionized the scrap automobile market. The shredder can pulverize entire car bodies so that the ferrous fraction can economically be removed by magnetic separation. During periods in 1974, automobile hulks were selling for $20.00 to $50.00 per body from scrap dealers.

Four industries in the New Jersey area; including the steel industry, the foundary industry, the ferro-alloy industry, and the export industry create a demand for ferrous scrap.

The steel industry receives scrap metal from municipal wastes in three forms: 1) raw, unincinerated scrap; 2) incinerated scrap residues; and 3) detinned scrap. Scrap from municipal solid waste is usually of unknown quality and it contains many impurities that make it unsuitable as a high grade scrap. In addition, "white goods" such as washers, dryers, refrigerators, stoves, etc., that enter the solid waste stream are contaminated with an enamel coating (frit). Frit produces sulfur in the steel making process and every effort is made to prevent frit from entering the furnances. Therefore, to re-use white goods as scrap input, the appliances must be shredded, which essentially blasts the frit off of the surfaces, and then the ferrous portion must be separated from the frit contaminants.

Tin is an undesirable input to the steel process because it alloys with steel and it cannot be removed by processing. Tin in steel creates brittleness and poor surface texture. In addition, tin causes deterioration of furnace refractories. Experience has found that if the tin content of steel is kept below 0.06 percent, problems do not occur. In 1968, the tin content of municipal solid waste was approximately 0.2 percent, more than three times the recommended maximum.

Detinning municipal scrap raises its value as a scrap input to the steel making process. M & T Chemicals, Inc., in Elizabeth, New Jersey, a subsidy of the American Can Company, is currently detinning tin-coated cans for resale of the steel and tin components. According to plant officials, the plant capacity is 80,000 tons of ferrous scrap per year, and could be expanded to accept new, stable supplies. The material delivered to them must be relatively free of paper, rags, and other non-metallic contaminants.

The use of aluminum tops on steel beverage cans is another contaminant that must be separated before the steel can be recycled. Aluminum is not as detrimental as tin in the steel making process but it must be introduced under controlled conditions, not mixed in with steel cans. Aluminum separation is accomplished by shredding the containers and then magnetically separating the ferrous portion.

Lead, also must be controlled when added to the steel making process. Lead improves the machineability of steel. However, it is extremely harmful to furnace bottoms and refractories. Since lead has a low melting point, 650°F, incineration easily removes the lead from the cans where it collects the ashes.

Copper, in the form of copper wire in municipal solid wastes, is another contaminant that is an undesirable input to the steel making process. The maximum acceptable level of copper in the steel process is 0.1 percent. Levels higher than this tend to weaken the steel.

The use of ferrous scrap found in municipal solid waste by the foundry industry is not optimistically viewed because of low-density bundles which result in great yield losses and impurities. The ferro-alloy industry appears willing to accept limited quantities of incinerated scrap. The export market for municipal scrap also appears to be limited since similiar problems are experienced in exporting as in the domestic market. Thus, it appears that the major market for raw municipal ferrous scrap exists at detinning companies which process the scrap and sell the considerably up-graded steel scrap to the steel industry.

Prices paid for ferrous scrap vary with the demand for the material and the end-use intended for the scrap. For example, a detinning plant in Elizabeth, New Jersey, which utilizes its ferrous scrap to recover tin pays 35 percent of the No. 1 bundle market price in Philadelphia. In September, 1974 the ferrous scrap was worth $49.00 per ton. Of course, as the market prices for No. 1 bundle steel fluctuate, the ferrous scrap prices will also fluctuate.

Table VII-4 shows the results of a survey of several firms in the New Jersey area utilizing scrap ferrous metals.

## MARKETS FOR NON-FERROUS METALS

Non-ferrous metals such as aluminum, copper, zinc, lead, nickel, colbalt, chromium, and others represent 0.6 to 1.0 percent of municipal solid wastes. These non-ferrous metals often occur mixed with other metallic substances and require expensive processing to separate the components. However, the prices paid for the non-ferrous components are high and may justify added processing costs. For example, a secondary materials dealer contacted by M. Disko Associates in 1974 indicated he was paying the following prices for non-ferrous metal; aluminum, $300.00 per ton; copper, $1,000.00 per ton; brass, $600.00 per ton; and lead, $200.00 per ton. Table VII-5 lists dealer prices for various non-ferrous metals.

Approximately one-half of all the non-ferrous metal found in municipal solid wastes is aluminum. The use of aluminum is increasing with such items as aluminum containers, cans, foils, and trays becoming widely accepted by consumers. It is

TABLE VII-4

SURVEYED SCRAP FERROUS METAL UTILIZATION, 1974

| NATURE OF COMPANY | SCRAP METAL CONSUMPTION TONS/MONTH FOR EACH COMPANY | SOURCE OF SCRAP METAL: PRODUCTION WASTES FROM OTHER SOURCES | | COMMUNITY RECYCLING PROGRAMS | | DEMOLITION PROJECTS & WHITE GOODS | |
|---|---|---|---|---|---|---|---|
| | | tons/ month | % of total | tons/ month | % of total | tons/ month | % of total |
| Metals Detinner | 35,000 | 33,250 | 95% | 1,750 | 5% | - | - |
| Metals Detinner | 500 | 483 | 96.5% | 17 | 3.5% | - | - |
| Scrap Metals Dealer | 100 | 50 | 50% | 25 | 25% | 25 | 25% |
| Scrap Metals Dealer | 40 | 20 | 50% | 10 | 25% | 10 | 25% |
| Scrap Metals Dealer | 20 | 16 | 80% | 4 | 20% | - | - |
| TOTAL | 35,660 | 33,819 | 94.8% | 1,806 | 5.1% | 35 | 0.1% |

NOTES: Data from Questionnaire Survey by M. Disko Associates, 1974

TABLE VII-5

DEALER PRICES FOR NON-FERROUS METALS

| ITEM | PRICE - DOLLARS PER POUND | | |
|---|---|---|---|
| | JANUARY 7, 1974 | JUNE 3, 1974 | JANUARY 6, 1975 |
| Aluminum, Ingot | $ 0.29 | $ 0.315 | $ 0.39 |
| Copper, No. 2 Scrap | 0.67 | 0.32 | 0.37 |
| Lead | 0.18 - 0.19 | 0.19 - 0.21 | 0.24 |
| Tin | 2.95 | 4.38 | 3.36 |
| Zinc | 0.28 - 0.32 | 0.34 - 0.35 | 0.38 - 0.40 |

SOURCE: JOURNAL OF COMMERCE

Dealer prices in the New York area

estimated that there are 800,000 tons of aluminum yearly in the nation's solid waste quantities, with only about 10 percent currently recovered. Aluminum scrap is obtained from three sources: 1) internal production waste, 2) fabrication and conversion wastes, and 3) obsolete products. Approximately 81 percent of all recycled aluminum comes from internal production, fabrication, and conversion scrap.

It is more economical to re-process aluminum scrap into new products than it is to produce new aluminum from raw materials. Thus, aluminum scrap enjoys a high demand and corresponding high price. It takes 17,900 kilowatt hours of electricity to manufacture a ton of aluminum from raw materials but only 900 kilowatt hours of electricity (5% as much) to re-manufacture aluminum from recycled aluminum cans, etc.

The chief consumers of scrap in 1969 were secondary smelters, (67%) which convert scrap aluminum into secondary ingot; integrated producers, (19%) who convert bauxite into fabricated aluminum products; and non-integrated producers, (14%) who rely on scrap and primary and secondary aluminum ingot purchased on the open market.

Aluminum companies have been collecting and recycling aluminum cans and containers since 1958. As an example, the Reynolds Aluminum Company started a successful aluminum can recovery system in Los Angeles in 1969. Individuals and organizations received $200.00 per ton, (10 cents per pound) for aluminum cans brought to the Reynolds Redemption Center.

The success of the Reynold's plan has led other companies, including Coors Brewing Company, Kaiser Aluminum, and Alcoa Aluminum to start similar projects. These companies also pay $200.00 per ton for aluminum cans and containers delivered to them. During the latter part of 1974, Reynolds Aluminum increased their price from 10 cents to 15 cents per pound for aluminum cans.

There is a high demand for non-ferrous metals. Products such as aluminum, copper, lead, zinc and others are recycled in large quantities. Materials such as copper and lead are salvaged and recycled by hand sorting methods. Historically, there has been a good secondary market for non-ferrous metals. Favorable marketing conditions are expected to continue in the future.

MARKET FOR TEXTILES

According to industry figures, in 1968, some 5.7 million tons of textile fibers were consumed in the United States. The majority (46%) of the fibers were synthetic. Synthetic fibers are becoming increasingly popular. From 1968 to 1970, cotton consumption maintained a level of non-growth, wool consumption tripled, and other textiles such as silk, linen, jute, etc. grew modestly. Synthetic fibers are more difficult to recycle because they are often in combination with other fibers and separation is difficult.

Textile wastes generally originate from three sources. Textile mill wastes occur in the production process. The wastes include such fibers as cotton liners, vegetable fibers, jute, man-made fibers, and wool wastes. Generally, these wastes are consumed in paper and board manufacture as well as by pulp mills. They are also used by the textile industry to manufacture stuffing materials, backings, and felted products.

Other textile wastes originate in the apparel industry. Typically, these wastes include clippings, trimmings, and defective products such as cutting errors, ripped items, and soiled garments, which are converted to wipers or rags by the paper industry.

The third source of textile wastes is obsolete garments that are ready to be discarded or recycled. Generally, garments that have outlived their usefulness are collected by secondary materials dealers or charitable organizations for re-sale or re-distribution. Agencies such as the Salvation Army, Goodwill Industries, Volunteers of America, and other social service groups serve as secondary materials dealers in the textile industry.

With the exception of wool, there are few fibers that can be re-woven for re-manufacturing garments. Wool can be removed from garments and re-woven to create new fabrics. However, the 1940 Wool Labeling Act requires manufacturers to specify on the label the percentage of re-processed wool. The wool manufacturers, through massive media advertising, have conditioned the consumer to believe 100 percent virgin wool is superior to re-processed wool. Hense, the market for re-processed wool is limited.

There is no prospect for recovering uncontaminated textiles or fibers from mixed municipal solid waste for re-sale to a secondary materials dealer. It is possible that a small percent of material could be collected for re-sale as a raw material input to board manufacture, etc., where high contamination levels are acceptable.

## MARKETS FOR RUBBER

Rubber accounts for approximately one percent by weight of municipal solid waste. Tires constitute approximately 75 percent of all rubber waste; rubber reclaiming accounts for 24 percent; and tire splitting, cutting tires into gaskets, etc., accounts for the remaining one percent. Obsolete and worn tires are reduced by shredding and cracking, metals and contaminants are separated; the rubber is mixed with reclaiming oils and softened for re-use.

Recycled rubber has technical limitations since it cannot be substituted for virgin rubber, nor mixed with virgin rubber in large quantities. In addition, new virgin rubber and synthetic rubber are economically competitive with recycled rubber and consumer conditioning has resulted in a rejection of products with secondary rubber. The decline in the use of "re-capped" tires is an example.

One problem associated with recycling rubber tires is contamination. For example, a manufacturer cannot re-process studded snow tires or steel belted tires to re-use the rubber. As the popularity of these tires increases, the quantity of rubber tires recycled will decrease. Hand picking of the tires before further processing and separation of belted and studded tires is the only practical method available.

MARKETS FOR PLASTIC

The use of plastics in packaging and containers for the consumer market is increasing. Plastics constitute between 3 and 7 percent of municipal solid wastes in this area.

Essentially, there are two types of plastics; thermosetting and thermoplastic. Thermosetting plastic is formed by heat and once the initial "set" takes place cannot be remelted for re-manufacture. The second type of plastic, thermoplastic, can be remelted and thus is more readily recyclable. Approximately 80 percent of the plastics produced are thermoplastic.

The term "plastics" is a general form under which many different chemical substances fall. Some of the more popular compounds include, polyethylene (31% of total production), polystyrene (18%), and polyvinyl chloride (20%).

Recycling plastics from municipal solid waste is difficult because of the complex nature of the plastics and the contamination levels. At the disposal end, the plastics are well mixed and separating various types of plastics is virtually impossible. For example, there are over 700 grades of polyethylene alone. Other problems encountered include:

1) degradation of resin properties, 2) aging, 3) poor industry classification according to grades, and 4) lack of industry's acceptance of recycled plastic as a raw material input. There are, however, promising uses for plastics in the field of energy recovery. One pound of plastics (comprised largely of packaging wastes) has a fuel value of about 15,000 BTU's, about 50 percent more than the energy content of a pound of coal.

## MARKETS FOR GLASS

Essentially, there are three manufacturing segments of the glass industry: 1) containers (bottles and jars), 2) flat glass, and 3) pressed and blown glass. In 1967, these three segments contributed the following percentages, respectively, to the total production of the glass industry: glass container production, 73 percent; flat glass production, 15 percent; and pressed and blown glass production, 12 percent. As illustrated in the following table, the period between 1960 and 1970 saw substantial increases in glass production.

### TRENDS IN GLASS PRODUCTION

| Type of Glass | Millions of Tons Produced Per Year | | Percent Increase |
|---|---|---|---|
| | 1960 | 1970 | |
| Glass Containers | 6.5 | 11.3 | 74% |
| Flat, Pressed and Blown | 2.6 | 4.2 | 62% |
| Total | 9.1 | 15.5 | 70% |

Much of this production increase can be attributed to the increased acceptance of glass containers and the prevalence of "one-way" disposable glass jars and bottles. However, competition from plastic and metal containers is expected to slow the rate of increase of glass container utilization.

Essentially, the raw materials needed for glass production are sand, soda ash, and limestone in addition to various percentages of scrap (cullet). Generally, glass manufacturers use internally generated cullet in their production process. Cullet is a desirable additive to the glass making process for it liquifies at lower temperatures, thus conserving fuel and production costs.

There are two types of glass cullet: "in-house" or internal cullet and "purchased" cullet. In-house cullet includes rejected products at the plant, trimmings, and breakage. Glass plants rely heavily on the supply of in-house cullet because it is generally free of contamination and the glass quality is known. In addition, transportation costs are minimal. Occasionally, glass companies make inter-plant cullet transfers to balance company cullet supplies. In the glass container manufacturing process, all internally generated cullet is consumed. When in-house cullet supplies are insufficient to meet production demands, the glass manufacturers use outside sources of supply.

Cullet recycled back to the glass plants from outside sources is called purchased cullet. This generally includes bottles and containers from community recycling groups, bottling companies, and other large users of glass. Trends in recent years have shown a decreasing use of purchased cullet. For example, the container industry, which accounts for approximately 70 percent of total tonnage output, on a national basis, uses purchased cullet equivalent to only 1% of its raw materials. Table VII-6 shows a survey of the use of cullet by various glass facilities.

Two of the factors which reduce the use of purchased cullet are questionable quality of cullet supplies and cullet contamination. Contamination is usually present in the form of dirt or organic materials, or metal rings and caps on containers. Glass recycled from municipal solid waste is undesirable if colors are mixed. There are three colors of glass most commonly found in the container industry: amber, clear and green. Glass companies have limited use for cullet that has these three colors mixed. Therefore community recycling groups color-sort all glass collected. This is a very tedious and labor-intense operation and usually prevents full-scale glass recycling.

There are currently experimental, optical, glass-sorting machines that can be used to separate large volumes of mixed cullet into the three color types. Application of this sophisticated technology to a regional resource-recovery plant would enhance the market value of the glass cullet. There are a number of potential secondary uses that do not require strict color sorting and high cleanliness. For example, ground glass can be mixed with asphalt to produce "glassphalt" which could be used in road

## TABLE VII-6

## SURVEYED WASTE GLASS (CULLET) UTILIZATION, 1974

| NATURE OF COMPANY | WASTE GLASS CONSUMPTION TONS/MONTH FOR EACH COMPANY | SOURCE OF WASTE GLASS: IN-HOUSE PRODUCTION WASTES | | PRODUCTION WASTES FROM OTHER SOURCES | | COMMUNITY RECYCLING PROGRAMS | |
|---|---|---|---|---|---|---|---|
| | | tons/ month | % of total | tons/ month | % of total | tons/ month | % of total |
| Glass Manufacturer | 2,700 | 2,025 | 75% | 567 | 21% | 108 | 4% |
| Glass Manufacturer | 90,000 | 72,000 | 80% | 10,800 | 12% | 7,200 | 8% |
| Glass Manufacturer | 350 | 35 | 10% | - | - | 315 | 90% |
| Glass Manufacturer | 1,904 | 209 | 11% | - | - | 1,695 | 89% |
| Glass Manufacturer | 1,600 | 400 | 25% | - | - | 1,200 | 75% |
| Glass Manufacturer | 1,650 | 1,073 | 65% | - | - | 577 | 35% |
| Glass Manufacturer | 2,000 | 1,600 | 80% | - | - | 400 | 20% |
| Glass Manufacturer | 400 | 300 | 75% | - | - | 100 | 25% |
| Glass Manufacturer | 33 | 5 | 15% | - | - | 28 | 85% |
| TOTAL | 100,637 | 77,647 | 77% | 11,367 | 11% | 11,623 | 12% |

NOTES: Data from Questionnaire Survey by M. Disko Associates, 1974.

building applications. In addition, glass can be used in thermoplastic asphalt, sprays, and glass beads for reflective paint. In the building industry, glass can be incorporated into glass insulation.

## SOLID WASTE - A SOURCE OF ENERGY

Spiraling costs and increasing shortages of conventional fuels have made the recovery of energy from solid waste economically and environmentally attractive. The modification of power plant boilers and industrial boilers to allow the burning of shredded municipal solid waste materials as a supplementary fuel in conjunction with coal, oil, or gas can be an effective method of solid waste disposal for a community and a low cost source of fuel. Chapter VIII presents additional information on energy recovery systems.

In the past, energy recovery from solid waste has consisted of steam recovery from solid waste incinerators. The utilization of steam requires the existence of a distribution network of steam pipes and a relatively large user in close proximity to the incinerator (within about 1/2 mile). Typically, the steam supply will fluctuate as the solid waste loadings vary. If the facility uses coal, gas, or oil as an auxillary fuel to produce and maintain the steam supply, the steam becomes more marketable.

Since water-walled, refuse burning incinerators must handle the entire range of municipal solid waste materials, they have high capital and operating costs. In addition, new stringent Federal air pollution codes require air pollution abatement equipment to be built into the system.

In contrast, utilizing solid waste as a supplemental fuel in new or existing utility or industrial boilers entails the burning of a relatively clean mixture of shredded paper, plastic, and wood products. These burnable materials have on a per pound basis about one-half the heat content of coal. Ash and residue problems are limited, since metals, glass, dirt, stones, etc., are not fed into the boiler as in conventional incineration.

The so called "light fraction" consisting of shredded paper, plastic, wood chips, some yard wastes, and some textiles amounts to about one-half, by weight, and the bulk of the volume, of municipal solid wastes. The heating value of the shredded, air-classified solid waste is about 5000 BTU per pound (10 million BTU per ton). The BTU value fluctuates with the moisture content of the refuse. If the light fraction is dryed prior to shipment to the user, the fuel value would be more consistent and greatly enhanced.

The value of the solid waste as a fuel depends on several factors. The type of fuel it replaces (oil, coal, or gas), the cost of modifying the boilers, and the cost of firing the waste into the furnace must all be taken into consideration when accessing a net value for the waste.

The shredded paper, plastic and wood "fuel" is an economic source of energy. The following table presents some relative energy values of various fuels:

| FUEL | APPROX. HEAT VALUE | APPROX. COST PER UNIT* | APPROX. COST PER 100,000 BTU |
|---|---|---|---|
| Shredded Solid Waste "light fraction" | 5000 BTU/Pound | $ 5./Ton | $ 0.05 |
| Coal | 12,000 BTU/Pound | $33./Ton | $ 0.14 |
| Oil | 140,000 BTU/Gallon | $0.34/Gallon | $ 0.24 |
| Natural Gas | 100,000 BTU/Therm | $0.16/Therm<br>$0.09/Therm (interruptable) | $ 0.16<br>$ 0.09 |

* Cost values include allowance for ash handling for burning solid waste. Costs for coal, oil and gas are reported figures for industrial users, based on information supplied by a coal wholesaler, Eastern of New Jersey, and New Jersey Gas Company.

The use of solid waste as a supplemental fuel has great potential in a time of escalating fuel costs and limited fuel availability. Several benefits are obtained from using prepared solid waste as a supplemental fuel. The use of the solid waste is beneficial to the community in that a large volume of solid wastes are reclaimed. Landfill life is increased because only a smaller percentage of the original generated raw refuse is finally landfilled. In addition, the utility or industry benefits in getting a stable supply of low-cost, low-sulfur fuel.

CREATING MARKETS FOR RECYCLABLE MATERIALS

At this point, emphasis must be placed on a key aspect of a successful resource recovery program—the market for recycled materials. It is essential to have a reliable buyer for the recovered products. It must be emphasized that any technological development leading to increased separation of materials must be accompanied by a corresponding increase in market potential. Just increasing recovered quantities will not mean a market for the product.

Many of the secondary materials dealers and industries contacted by M. Disko Associates gave positive information on how markets for recyclable materials could be created. These concepts are listed as follows:

- Equalizing Transportation Costs. At present, costs for transporting many recycled materials, such as scrap metals, waste paper and textile wastes, are significantly higher, both in domestic and ocean freight, than their virgin material counterparts. Considerable pressure has been mounting recently to establish equitable and non-discriminatory freight rates for recycled materials.

- Tax Equalization. For many years, the Federal government has provided incentives, in the form of depletion allowances and capital gains benefits, to encourage primary industries to develop natural resources. While primary industries have grown and benefited from these incentives, there are no incentives provided to the secondary materials industry to encourage the investment in technology and equipment to extract recyclable materials from solid wastes. Presently, there is legislation before Congress which would give the recycling industry a tax incentive that would place it in a more favorable competitive position with industries that utilize virgin materials.

- Improved Technology. There is a need to develop new technology and improve existing technology with the capability of economically handling, processing, and recovering secondary materials from solid wastes.

- Research and Development. New methods must be developed to utilize low-grade solid waste materials. For example, processes have been developed to use waste glass in the manufacture of road building and construction materials. Similarly, light fractions (paper, plastic, yard refuse, etc.) can be used as a supplemental fuel to generate electricity. As new uses are developed for solid waste, a greater demand for the materials should result.

- Consumer Education. Since most individuals have a negative attitude about purchasing products made from recycled materials, a consumer education program should be established to create a better understanding of the quality of products made from recycled materials and to indicate the economic and social benefits of purchasing these products.

- More Favorable Procurement Policies. Until recently, purchasing agents representing both government and industry have generally confined their purchases to products made from virgin materials. Recently, some of these agencies have begun to revise their procurement policies to insure that, where feasible, products are purchased that contain recycled materials.

- Assessing Total Socio-Economic Costs for Material Use. If all the costs of virgin materials usage, including extraction, processing, environmental degradation, foreign trade imbalance, resource depletion, energy consumption, and solid waste disposal, were included in marketing prices, products made from secondary materials would, in all likelihood, be in a more favorable economic position.

- Design Products That Can Be More Readily Recycled. Products should be designed and produced which can be more readily recycled. In other words, will the product, once it has outlived its purpose, be able to be readily recycled?

It would appear that, if the measures outlined above, including tax equalization, equalized freight rates, more favorable procurement policies, consumer education, total costs assessment for materials use, and improved technological development, are implemented, the prospects for increased utilization of secondary materials would be enhanced. It is essential that increased efforts be made nationwide, in the development of secondary markets so that these markets will expand at a sufficient rate to absorb the secondary materials which technology is capable of recovering from solid wastes. Attempts to increase the amount of materials recovered from solid waste loadings should be accompanied by equal efforts to enhance the secondary materials market to absorb the increased amount of materials. If more secondary materials are recovered than are marketed, prices will decline and secondary materials will be either stockpiled or discarded like ordinary solid waste.

Table VII-7 presents a summary of markets for salvagable materials in southern New Jersey.

TABLE VII-7

SUMMARY DATA ON MARKETS FOR SALVAGABLE MATERIALS FROM MUNICIPAL SOLID WASTE IN SOUTHERN NEW JERSEY

| MATERIAL | TYPICAL PERCENTAGE BY WEIGHT IN SOLID WASTE | OVERALL MARKET PROSPECTS | MAJOR PROBLEMS PREVENTING RECOVERY |
|---|---|---|---|
| ENERGY | Light Fraction 40% - 60% | Excellent, particularly during current energy crisis (BTU per pound about 5000) | Availability of utility and industrial boilers to be converted to handle shredded solid wastes. |
| FERROUS METALS (IRON & STEEL) | 5% - 10% | Markets for detinned municipal solid waste scrap appear to be good. Processes being developed to recover bi-metal (aluminum-topped steel) cans. Markets for bulk scrap (automobile hulks, etc.) not as good because of high processing costs. | Contamination by other non-ferrous metals (tin-coated and aluminum-topped steel cans.) |
| NON-FERROUS METALS (ALUMINUM, COPPER, LEAD, ZINC, ETC.) | 0% - 1% | Good, particularly for aluminum, lead, copper, tin | High costs of collection and separation. |
| PLASTICS | 2% - 7% | Poor. Demand for fabrication plastic wastes less than supply | Large number of chemical formulations in plastic products makes it almost impossible to sort and recover these materials. |

TABLE VII-7, CONTINUED

SUMMARY DATA ON MARKETS FOR SALVAGABLE MATERIALS FROM MUNICIPAL SOLID WASTE IN SOUTHERN NEW JERSEY

| MATERIAL | TYPICAL PERCENTAGE BY WEIGHT IN SOLID WASTE | OVERALL MARKET PROSPECTS | MAJOR PROBLEMS PREVENTING RECOVERY |
|---|---|---|---|
| WASTE PAPER | 36% - 59% | Good for newsprint; high grade pulp substitutes; high-grade de-inking and corrugated waste paper. Virgin pulp shortage predicted for mid-1980's | Contamination; costs of collection and separation; incentives favoring use of virgin pulp. Rapid variations in supply and demand patterns and economic value. |
| GLASS | 7% - 15% | Good, if glass manufacturers could be assured of a steady and reliable supply of color-sorted material | Contamination; high costs of collection and separation; abundant supplies of low cost raw materials. For reuse as cullet, glass must be color-sorted. |
| TEXTILES | 1% - 7% | Limited markets. Use as wipers losing markets to paper towels and synthetic wipers | General low value because of cost of collection and separation. |
| RUBBER | 1% | Limited market. Retreaded tires losing markets to new tires | Higher productivity of rubber trees resulting in lower costs of "new" rubber, development of synthetic rubber. Consumer preference for "new" rubber. Glass and steel belted and studded tires cannot be recycled. |

# VIII. STATE-OF-THE-ART REVIEW OF SOLID WASTE DISPOSAL METHODS

## INTRODUCTION

In recent years, public and industrial interest in recovery of energy and materials, have led to major new advances in the field of solid waste disposal. The entire concept of burying solid waste and literally throwing away potential resources and energy is being critically reviewed. Major new methods such as shredding-landfilling, pyrolysis, and processing for materials and energy recovery are being developed as viable methods of solid waste disposal.

There are a number of important factors which must be evaluated before any one method of disposal is chosen. Some of these factors include:

- Flexibility and adaptability to change
- Ability to adapt existing solid waste collection systems to the disposal method
- Annual operating and maintenance costs
- Capital costs for equipment, site work, and facilities
- Considerations affecting site selection and environmental protection
- Technical feasibility of the disposal method selected
- Local conditions affecting the disposal of solid waste
- Public acceptance and support for method of disposal
- Potential for future reclamation or recycling efforts

The remainder of this chapter will be devoted to a discussion of the various solid waste disposal methods that are available today. Emphasis shall be placed on resource and energy recovery systems.

SANITARY LANDFILL

A sanitary landfill is a method of disposal whereby solid waste is placed on the ground or in trenches, compacted for volume reduction, and covered with soil at the end of each day's operation. There are essentially three methods of sanitary landfilling which are described as follows:

> The Trench Method, or cut and cover method typically employs a series of parallel trenches that are excavated with a dragline, bulldozer or other earth-moving equipment. Generally, the trenches are about 10 to 20 feet deep, about 20 feet wide, and 100 or more feet long. The refuse is dumped into the trench and compacted by rolling with heavy earth-moving equipment. The cover material used for the daily 6 inch cover and the final 2 foot cover is obtained from the next trench. When the landfill is completed, the site will consist of a series of long, parallel solid waste cells. An advantage of the trench method is that upon completion of the landfilling operation, the original topography of the site has essentially remained unchanged. The trench method cannot be used in areas of high groundwater.

> The Area Method, or fill and cover method, is the most common method used in Ocean County. This method consists of placing refuse on an essentially flat area, compacting the refuse with heavy equipment, and covering the refuse with soil. Generally, cells 10 to 12 feet high are created. The landfilling operation continues until the area has been utilized. Many landfills using this method employ several lifts to increase the volume of the landfill. This method is used to fill and reclaim low-lying land, quarries, ravines or other depressions. Cover material is either obtained from the landfill or it must be trucked onto the site.

# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

## CROSS SECTIONS OF VARIOUS LANDFILLING METHODS

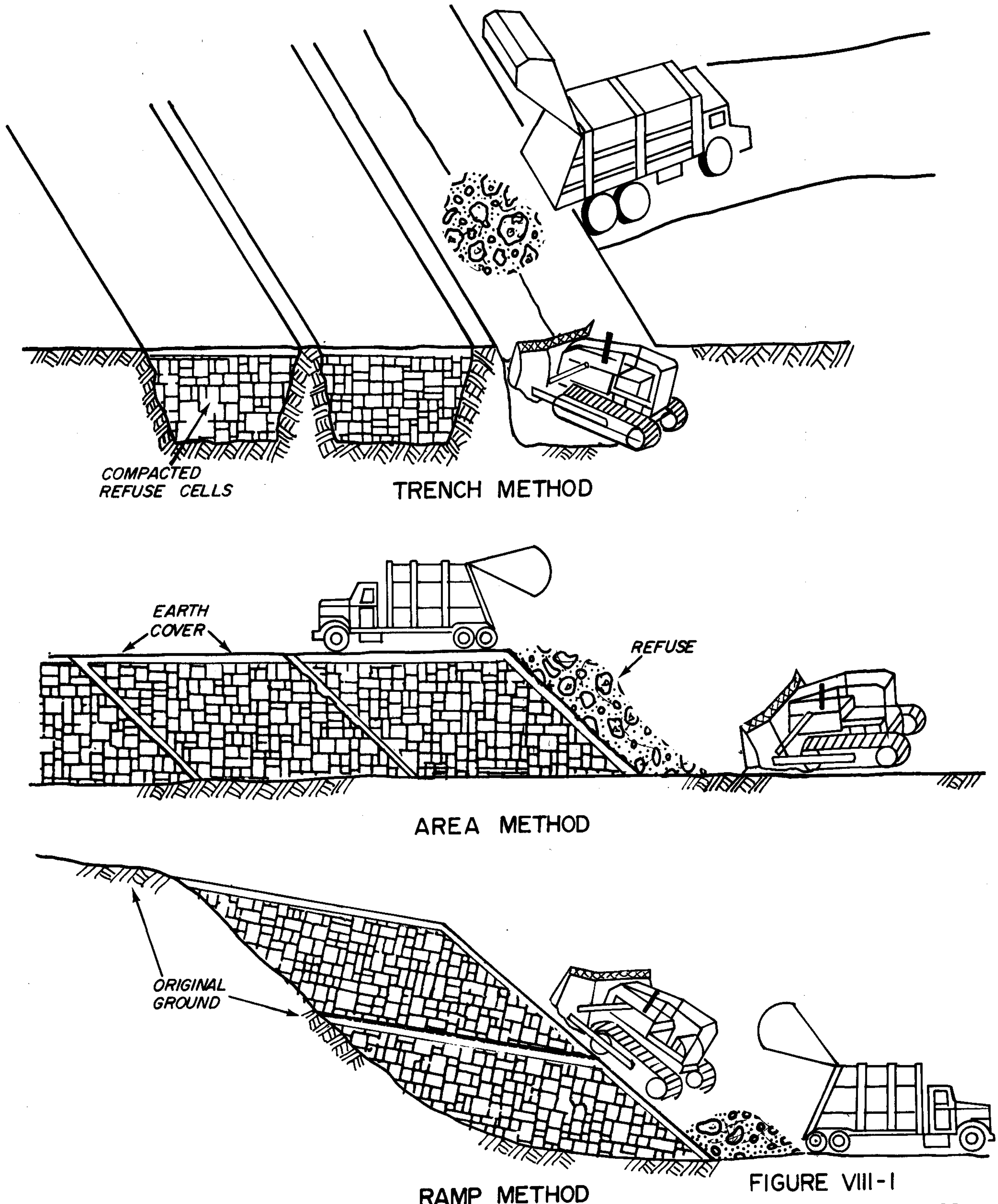



FIGURE VIII-1

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The Ramp or progressive slope method is used where large quarries, canyons or ravines are available to be filled. This method is not used extensively in Ocean County. The solid wastes are dumped onto a working face, compacted, and covered. The slope of the working face is usually about 1 vertical on 5 horizontal. Bulldozers push the refuse up or down the working face to maintain the slope compacting the material as work progresses. Cover material is obtained from the base of the working face or it is trucked onto the site from other areas.

Sanitary landfilling reduces the environmental hazards associated with open dumping. A well-run landfill will have a minimum of environmental problems. Such nuisances as blowing paper, insects, vermin, odors and fire hazards can be greatly reduced by simply covering the refuse at the end of each day's operation. However, groundwater pollution from leachate, methane gas dangers, odors, and insects can be a problem even in a well-run landfill. It is important to stress that a sanitary landfill, in one form or another, must be an integral part of any complete solid waste disposal scheme. Even if resource recovery is employed, a certain percentage of the waste will be non-usable residue which will require ultimate disposal in a sanitary landfill. Table VIII-I lists some of the advantages and disadvantages of the sanitary landfill as a method of solid waste disposal. All of the residential solid waste generated in Ocean County is landfilled. The County utilizes in-county and out-of-county landfills for residential solid waste disposal.

## VOLUME REDUCTION TECHNIQUES

One of the most recent advances in solid waste processing and disposal is the growing use of volume reduction techniques coupled with sanitary landfilling and/or resource recovery.

TABLE VIII-1

ADVANTAGES AND DISADVANTAGES OF
SANITARY LANDFILL FOR SOLID WASTE DISPOSAL

| ADVANTAGES | DISADVANTAGES |
|---|---|
| • A sanitary landfill can be an economical method of disposal provided a large tract of land is available. Costs range between \$2.00 and \$3.50 per ton in southern New Jersey. | • The New Jersey Department of Environmental Protection has instituted new environmental criteria that, when enforced, will require landfill operators to install monitoring wells, leachate collection systems, etc. The costs of landfilling, therefore, will increase. |
| • The landfill site can reclaim marginal land. When completed, low-lying or marginal land can be utilized for recreational uses or light construction. | • Landfilling is wasteful. The refuse contains large quantities of recoverable metals and energy. Burying the refuse makes recovery of these potential resources impossible. |
| • Sanitary landfill is a reliable, proven method of solid waste disposal. | • The landfill operation can impact adjacent land uses. |
| • A landfill is necessary to receive residue from the other solid waste disposal systems. Pyrolysis, incineration, and complete resource recovery still have a small percentage of residue that must be landfilled. | • The landfill can be visually objectionable if it is not buffered from roads, residential areas, etc. |
| | • The landfill requires large acreages of land. In densely populated areas, it is difficult to acquire the large areas of land necessary. |

Shredding, milling, pulverizing, and other size reduction operations take relatively heterogeneous solid wastes and shred them into a smaller, more homogeneous mixture, of relatively uniform size. The following types of size reduction equipment are in use: 1) crushers, 2) shears, 3) shredders and chippers, 4) rasp mills, 5) drum pulverizers and 6) hammermills. The hammermill design is used in most of the volume reduction installations in the country. Figure VIII-2 illustrates the various volume reduction techniques for solid waste processing which include the following:

Crushers. Of the four types of crushers illustrated on Figure VIII-2, the impact crusher has the most universal application. The impact crusher is a form of hammermill which rips or tears the materials introduced to it between two surfaces. The jaw, roll, and gyrating crushers employ the force of compression to reduce the size of the influent waste material. These units function best when friable material is used. At the present time, their main applications are in mines and quarries. However, their application in the reduction of solid waste is most promising for materials such as glass, porcelain, etc.

Shears. The use of the single-blade shear in size reduction is directly applicable to solid wastes. The shear employs the use of shear forces to cut material introduced to it. Existing shears vary from the alligator-type shown in Figure VIII-2 to multiple-blade hopper types for large-scale processing. Primarily, the shear could be used to reduce bulky items like large appliances, lumber, demolition wastes, and junked automobiles. The single-bladed shears are most applicable for use on metals from a wide variety of sources. Multiple-blade shears are most commonly employed for continuous, automatic reduction of lumber products, furniture, and other oversized items.

Shredders and Chippers. Shredders and chippers which are suitable for use in the solid waste field are the pierce-and-tear shredder, the mobile waste chipper, and the large automobile-type shredder. The pierce-and-tear shredder operates using tension and shear forces to reduce the influent material. Through the use of overlapping fingers, which are relatively

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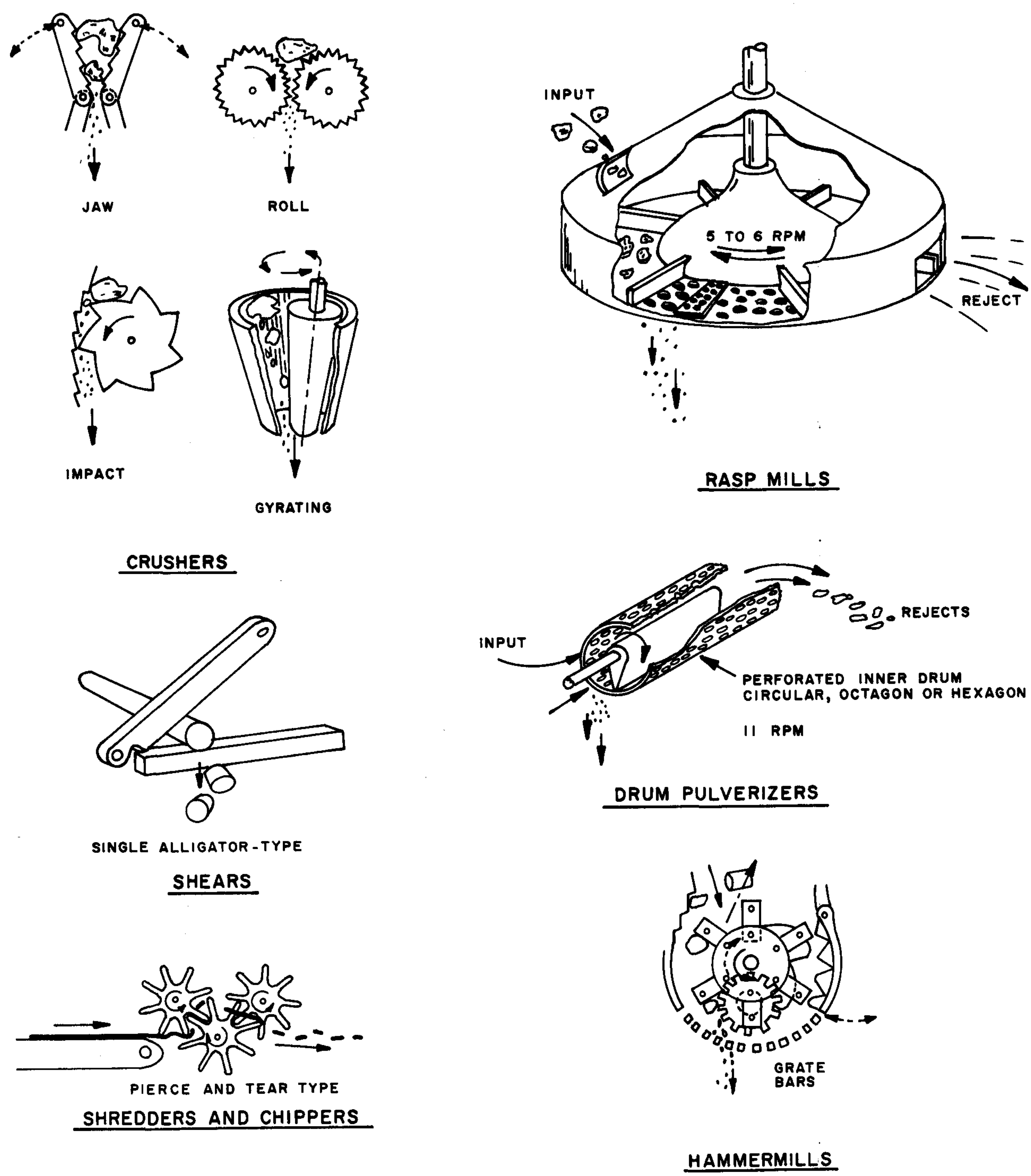
## BASIC REDUCTION PRINCIPLES OF CURRENTLY MANUFACTURED SIZE REDUCTION EQUIPMENT




SOURCES: RECOVERY AND UTILIZATION OF MUNICIPAL SOLID WASTE, SOLID WASTE MANAGEMENT REPORT SW-106, 1971

FIGURE VIII-2

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CONSULTING ENGINEERS

dull and operated at various pre-set speeds, the shredders pierce, tear, and shear the material introduced to them. The application of these units is best suited to fibrous or ductile material like paper and paper products. The mobile waste chipper is most functional for yard-type wastes such as branches and small trees because of the need for sharp blades to perform the cutting action. The larger shredders which are used to reduce bulky items like whole automobiles operate using the principles of tension and shear for reduction and are basically a type of large hammermill.

Rasp Mills. A rasp mill is a multi-purpose unit which employs all three forces used in size reduction: tension, compression, and shear. The illustration on Figure VIII-2 of the rasp mill shows the processes used in a typical unit. The unit is cylindrical in design with diameters in the range of 20 feet. Through the large input opening on the conical top secion, a wide variety of solid wastes can be introduced to the unit.

The waste is reduced in size as it passes over the rasping pins. To bring the waste in contact with the pins, the internal rotor, which operates at 5 to 6 RPM, swings the heavy connecting arms around and moves the wastes to the pins. As the size of each particle reaches the proper reduction, it falls through the outlet at the bottom of the unit. Through the design of the unit, the mill has been made self-limiting. If an item is too bulky to be reduced by the unit, in time it will be moved to the exit port and rejected. At this time, most applications of rasp mills are in composting plants.

Drum Pulverizers. The drum pulverizer operates on basically the same process as the rasp mill. The basic unit consists of a rotary drum of approximately 10 feet in diameter and the pulverizing unit. The drum itself can be either circular, octagonal, or hexagonal in design and can revolve at speeds up to about 10 RPM. A churning effect can be produced with the unit by the addition of stationary or contra-rotating beaters or baffles. As the particles are reduced, they are forced through the openings in the drum and out of the unit. The exit holes can be graduated to obtain a rough size separation.

Hammermills. The hammermill design of equipment for size reduction is the most widely used in the solid waste field. The basic two designs of hammermills are the swing hammer and rigid hammer. Units can be designed for either a vertical or horizontal position. Each type of hammer can vary greatly in design. Swing hammers vary from the rectangular block design, to sharp choppers and flexible flails, to a ring hammer with multiple wearing corners. The rigid hammers can vary in design from the thin, sharp choppers to the wide, blunt impact-crusher type. A common practice with these units is to provide for clearance adjustments to compensate for wear. An additional feature employed on some units are plate conveyor-type impact surfaces, which decrease wear and provide an anti-jamming effect.

One additional variation which may be coupled to the standard hammermill design is the use of shredding members joining with the hammers. These members may be stationary or moving. The usual method of determining effluent size from any of these units is through the use of grating bars. Other alternates to this method include machine speed, or clearance between the hammers and impact surfaces.

The hammermill employs the forces of tension, compression, and shear to effectively reduce the size of the wastes. If the exclusion of durable bulky items is desired, the hammers can be designed to swing upward. This upward swing will cause any object not readily amenable to reduction to be thrown upward and out of the unit. Even though hammermills can accept a wide variety of materials, the adjustment of the feed rate is most critical for obtaining efficient operation.

## SHREDDING AND LANDFILLING

The introduction of volume reduction techniques to landfilling has substantially improved the overall operation. Although originally practiced in Europe in connection with composting operations, there are many installations throughout the United States that have proven the value of shredding solid waste prior to landfilling. Some of the installations include Madison, Wisconsin; Pompano Beach, Florida; Tacoma, Washington; Vancouver, Washington; New Castle County, Delaware; Syracuse, New York; DeKalb County, Georgia. In addition to these operating facilities, there are many that are in the planning or construction stages throughout the Country.

Shredding reduces solid waste to a homogeneous mixture of uniform particle size. There are many benefits to landfilling the shredded refuse, some of which include:

- Landfill space is reduced hence landfill life is extended.
- Odors are reduced because food particles are scattered and absorbed by the paper refuse.
- Fire hazards are minimized because of the great reduction in air spaces and voids.
- Shredding reduces bulky items, such as refrigerators, to more manageable proportions.
- The visual impact of conventional landfills is eliminated because shredding reduces large objects (refrigerators, mattresses, washing machines, etc.) to smaller, less objectionable pieces.
- Vermin and insect problems are reduced because food particles are dispersed and absorbed by the paper.
- Landfill settlement is reduced because of the reduction of the voids and the greater compaction densities
- Shredding enhances separation of metals for reclamation because of the small, uniform particle size and the general reduction of entrapments.
- Decomposition of shredded materials is generally faster than ordinary landfilled materials; the shredded materials decompose to a relatively inert fill.
- Drifting paper is reduced because the small, shredded paper components are not easily moved by the wind.
- A shredding facility is the first step in resource recovery processing. Additional components can be added to reclaim materials after the shredding operation.

The cost of a shredding plant is in the range of $1.5 to $2.5 million for a 500 ton-per-day plant. Operating cost for the shredding and landfilling operation range from about $3.50 to $6.00 per ton. Costs for land acquisition are additional.

## INCINERATION

Incineration is a process by which materials are reduced through controlled combustion, primarily to carbon dioxide, other gases, and ash or frit. Incineration is not a complete disposal operation; it is primarily a volume reduction process. The end products of incineration, the residues and the gases emitted into the atmosphere, require additional disposal or processing. Gas and particulate matter must be cleaned from the stack emissions, and the residue, which is inert and relatively free of organics must be landfilled. Volume reduction by incineration of municipal solid waste is approximately 75 to 90 per cent and the weight reduction in the combustible portion is usually from 98-99 per cent. Approximately 75-90 per cent reduction, by weight, of the total incoming refuse can be achieved.

In typical conventional incinerators, refuse burns on moving grates in refractory-lined chambers, and combustion gases and entrained solids burn in secondary combustion chambers. Temperatures of about 1200$^{o}$F to 1800$^{o}$F are maintained by controlling the air flow. Higher temperatures in conventional incinerators result in the formation of slag (molten metal) on the grates and refractories.

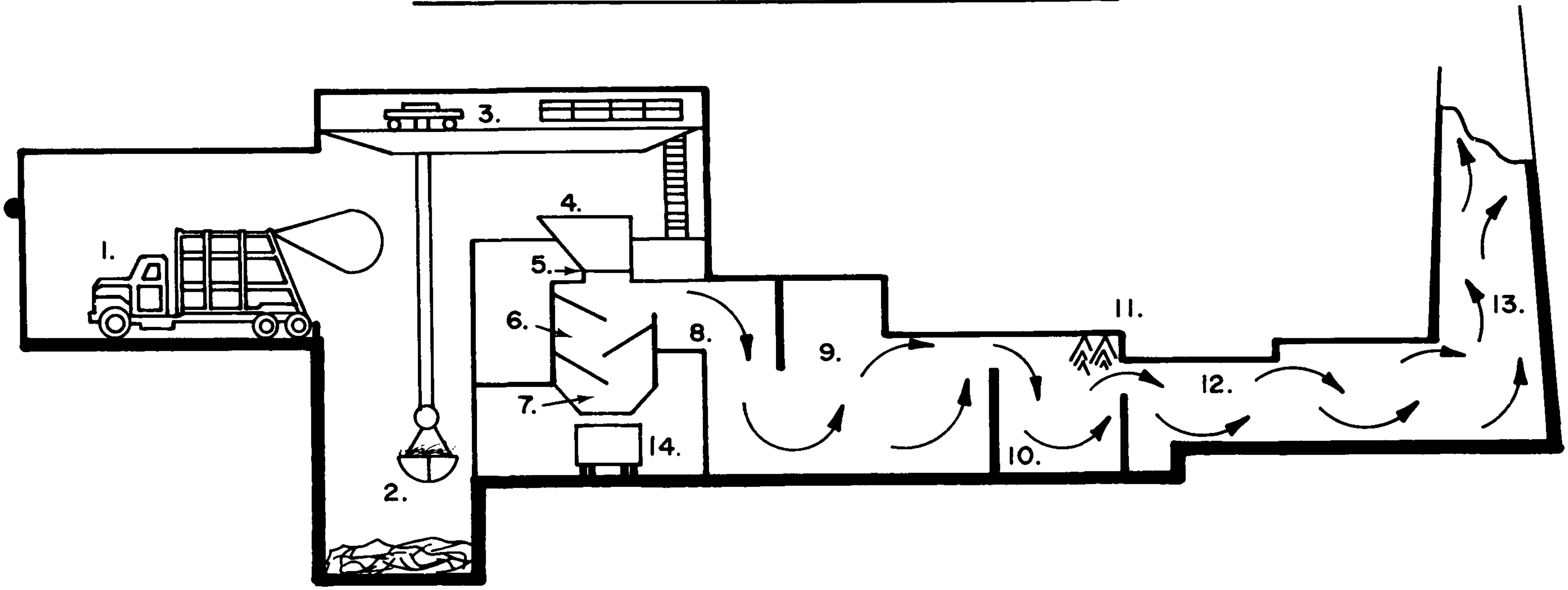
Figure VIII-3 shows a schematic of a typical municipal solid waste incinerator. Many methods are being used to control stack emissions which are dominantly fly ash. Proper design and operation can prevent emission of odors.

There are several important criteria that should be considered when planning an incinerator facility. Some of these include:

- Characteristics of the site
- Physical plant layout and process design
- Structural design of supporting systems
- Facility to be located in industrially zoned area
- Minimum impact with operation or appearance of surrounding buildings and land use

# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

## TYPICAL REFUSE INCINERATION SYSTEM




### LEGEND

1. DISCHARGE FLOOR
2. STORAGE BIN
3. BRIDGE CRANE
4. CHARGING HOPPER
5. HYDRAULIC GATE
6. FURNACE
7. ASH HOPPER
8. COMBUSTION CHAMBER
9. EXPANSION CHAMBER
10. FLY ASH REMOVAL
11. WATER SPRAYS
12. FLUE
13. CHIMNEY
14. ASH REMOVAL

FIGURE VIII-3
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- A comprehensive public relations program should be instituted

Air pollution abatement equipment necessary to meet local, State and Federal air pollution codes is very expensive. On smaller incinerators (under 400 tons-per-day) the cost of this equipment can double the capital cost of the facility and even on larger units, it amounts to an appreciable percentage.
Air pollution control equipment currently being used to meet the codes includes: mechanical cyclones, wet scrubbrrs, filter bag collectors, and electrostatic precipatators. These devices are efficient in removal of particulate matter. Smoke or submicronic particles can be eliminated by proper combustion control in the furnace, or by collection in bag filters and electrostatic precipatators. Odors can be controlled by wet scrubbers.

It is important in comparing the costs of air pollution control equipment to include both capital costs and operating costs. For example, the initial cost of the high efficiency devices (scrubber, electrostatic precipatator, and fabric filter) are three to six times the cost of lower-efficiency devices (settling chambers, cyclones, multi-cyclone). However, while an electrostatic precipatator is high in initial cost, about twice the cost of a scrubber, the operating costs of an electrostatic precipatator are only about 30 per cent of those for a scrubber. Table VIII-2 gives efficiencies of removal for various air pollution control devices.

There are several advantages to incineration of municipal solid waste including:

- Incineration is a volume reduction process. The residue,

TABLE VIII-2

AVERAGE EFFICIENCY FOR AIR POLLUTION CONTROL DEVICES

| TYPE | VOLATILE METALS | MINERAL PARTICULATE | NITROGEN OXIDES | SULFUR OXIDES | HYDROGEN CHLORIDE | POLYNUCLEAR HYDROCARBONS |
|---|---|---|---|---|---|---|
| None (flue only) | 2 | 20 | 0 | 0 | 0 | 10 |
| Water Spray Chamber | 5 | 40 | 25 | 0.1 | 10 | 40 |
| Mechanical Dry Cyclone | 0 | 70 | 0 | 0 | 0 | 35 |
| Wet Scrubber | 80 | 90 | 65 | 1.5 | 95 | 95 |
| Electrostatic Precipitator | 90 | 99 | 0 | 0 | 0 | 60 |
| Fabric Bag Filter | 99 | 99.9 | 0 | 0 | 0 | 67 |

Removal efficiency in percent of weight

which is inert ash, is relatively stable and presents little environmental hazard. Landfill acreage requirements are reduced because the volume of waste requiring landfilling is small.

- Since an incinerator facility can be sited on ten or twelve acres of land, as opposed to several hundred acres for an landfill, it can be located in an industrially zoned area near the center of population. This reduces haulage costs.

- Waste heat can be recovered in the form of steam from municipal refuse-burning incinerators. Municipal refuse averages about 10 million BTU's per ton.

- The incinerator operation is independent of the climate or weather.

Some of the disadvantages of municipal solid waste incineration include:

- Incineration is in a period of change and experimentation. Recently, stringent air pollution codes have forced many incinerators, some only a few years old, to either spend millions of dollars to upgrade or close down.

- Incinerators involve high initial capital costs and operating costs ($7. to $20. per ton for a 1000-ton-per-day facility). It is one of the most expensive methods of solid waste disposal.

- Incineration wastes materials and energy that have potential value if reclaimed. Metals, glass, and energy in the form of paper can be reclaimed from municipal refuse for recycling. Incineration hinders and destroys much of this potential for recycling.

- Incinerator residue ultimately requires a sanitary landfill for disposal.

In recent years, stringent new environmental regulations have forced many incinerators to upgrade their operation. As a result of this, technology in the incinerator field has advanced rapidly bringing forward many new designs and systems. Some of these systems include: 1) fluidized bed incineration, 2) ultra-high temperature incineration, 3) heat recovery incinerators, 4) development of air pollution control devices, and 5) pretreatment of refuse by shredding.

FLUIDIZED BED INCINERATION

A fluidized bed incinerator consists of a layer of inert material, usually sand and some fine ash which is suspended by an air stream entering at the bottom of the bed. Initially, air and a fuel (propane, oil, etc.) are fired and passed through the sand bed. This action pre-heats the sand particles to combustion temperature and acts to suspend the sand. Solid waste is injected into the bed and is efficiently incinerated. The combustion of the waste supplies enough energy to maintain the temperatures in the sand bed. The auxiliary fuel supply is only needed to initially heat the bed to the proper temperature and make up any small heat losses. Figure VIII-4 shows a schematic diagram of a fluidized bed incinerator. There are many advantages to the fluidized bed incinerator, some of which include:

- Combustion is rapid and complete
- There are less hydrocarbons emitted into the air
- Since the incinerator runs at relatively low temperatures, there is no appreciable nitrous oxide generated, less costly construction materials are required, and steam generation is more easily adapted
- Minimal air pollution control equipment is needed
- Air handling costs are minimal

Some of the disadvantages of the incinerator include:

- Experimental results on heat recovery and large-scale operation are not yet available.
- The diversity of solid waste demands an auxiliary fuel to maintain the bed if the refuse fails to maintain the required temperatures.
- The injection of the waste and the removal of the ash

# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

## TYPICAL FLUIDIZED BED INCINERATOR

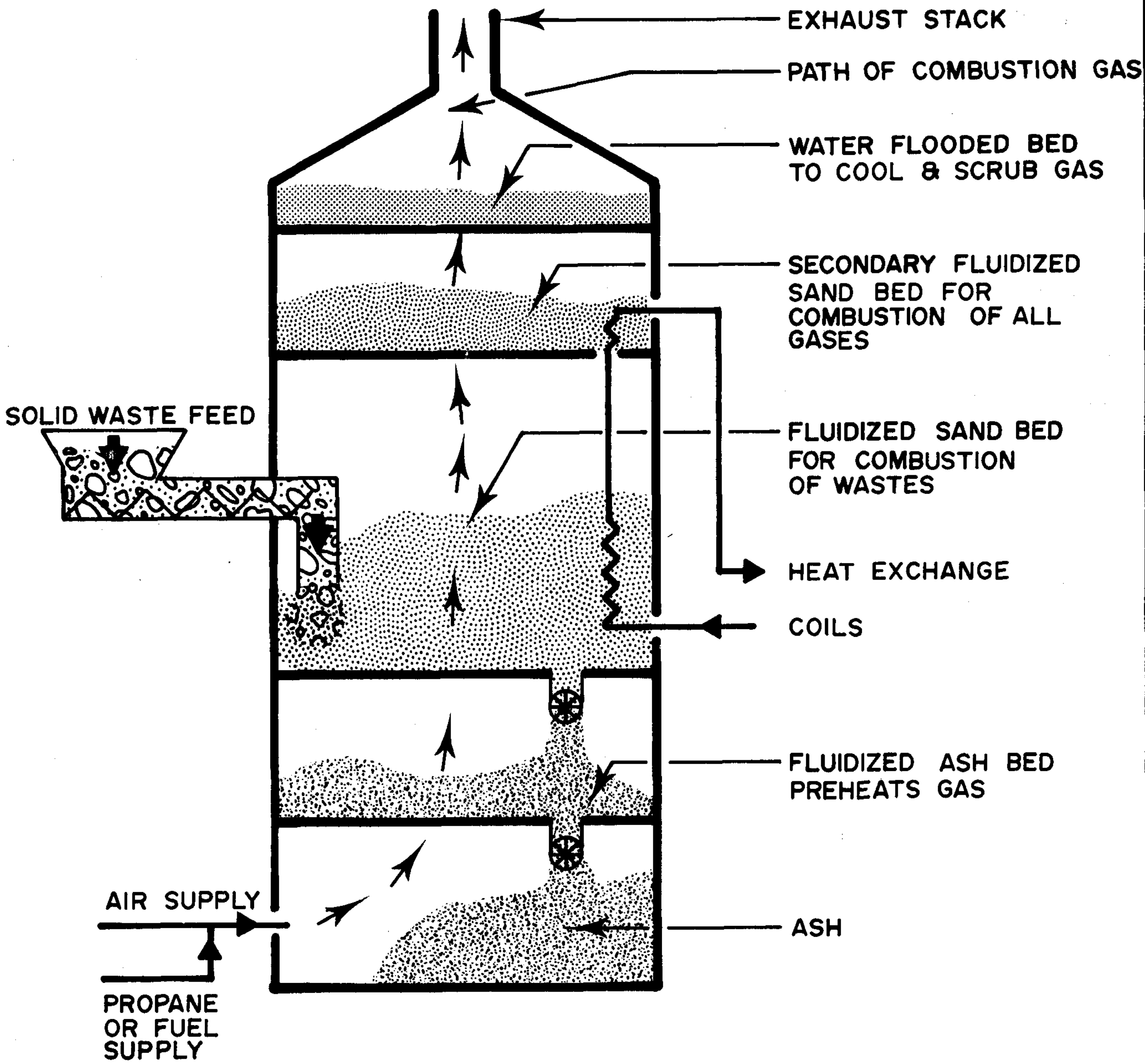


FIGURE VIII-4
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CONSULTING ENGINEERS

have not been perfected.

ULTRA-HIGH TEMPERATURE INCINERATION

Ultra-high temperature incineration is a combustion process in which temperatures in the range of 2600°F bring about nearly complete reduction of combustible solid waste. Reportedly, the end products consist of a gaseous combustion product and a molten slag. When quenched in water, the slag becomes an inert material, usable as a fill material or aggregate. The initial capital costs are high for ultra-high temperature, usually ranging between $10,000 to $20,000 per ton of rated capacity. Some of the more common ultra-high temperature incinerators are described herein. Figure VIII-5 illustrates schematics for three such systems.

- The Drivo-Fik process has been used in industrial incineration in Europe for several years. The process uses shredded refuse which falls through vertical tubes into a primary combustion chamber. The combustion chamber is fed by preheated air at near stoichiometric conditions. The shredded refuse forms hot gas and fused ash, which discharge through an opening in the primary combustion chamber, pass through an after-combustion chamber, and finally exit as waste gas and slag. The waste gas is used to preheat the air entering the primary combustion chamber.

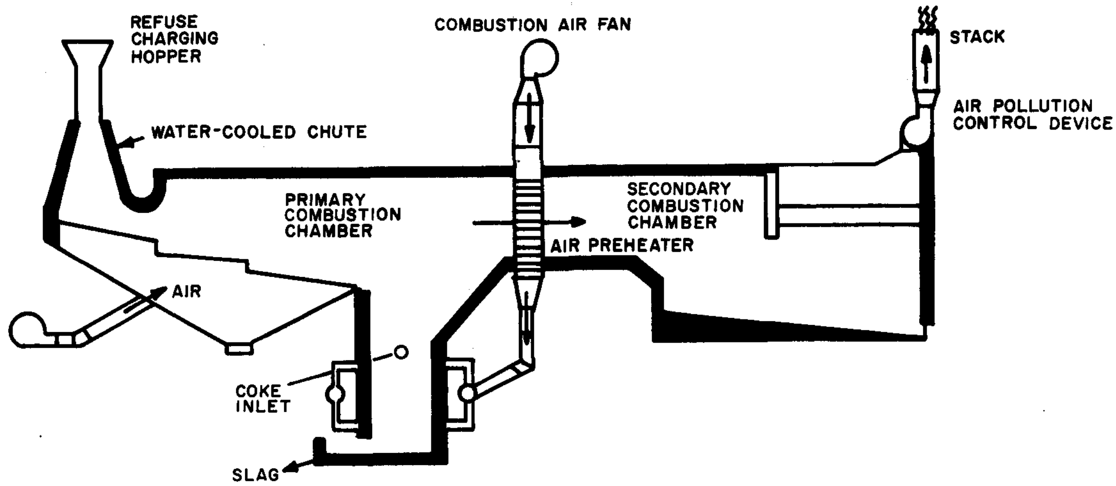
- The American Thermogen process uses refuse combined with an auxiliary fuel such as coke and/or natural gas. The refuse is loaded into the middle of a vertical shaft furnace. Refuse is completely oxidized in suspension, with the hot gas rising and the fused ash falling to the bottom of the shaft as slag. Air for the oxidation enters at stoichiometric quantities and is preheated by the combustion gas.

- The Sira process uses shredded refuse which is injected by an air blower into a combined primary and secondary combustion chamber. All metals are removed prior to injection of the refuse. Refuse is burned in suspension, using auxiliary gas or oil fuel, and preheated stoichiometric amounts of air. The molten slag drains from the chambers.

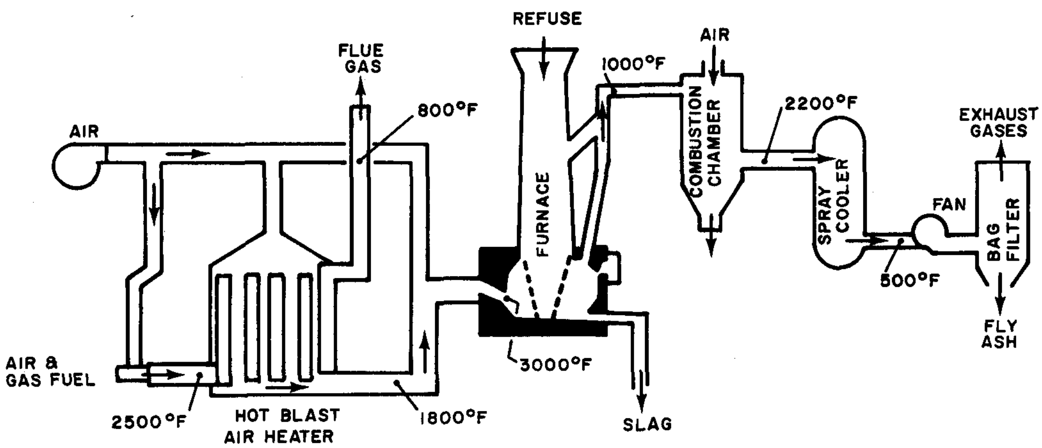
# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

## ULTRA-HIGH TEMPERATURE INCINERATION SYSTEMS

### FERRO-TECH PROCESS




### TORRAX PROCESS




### SIRA PROCESS

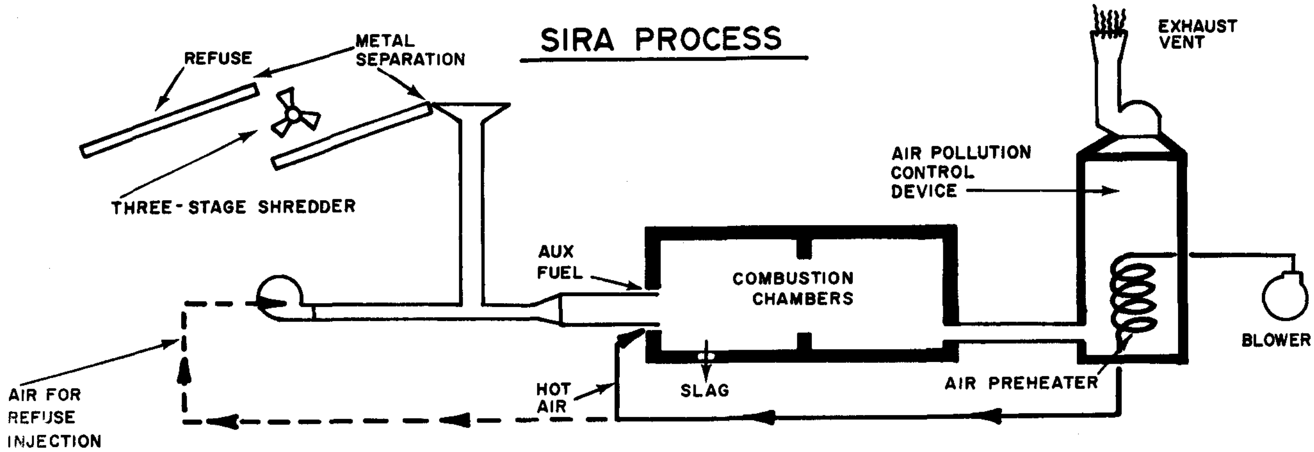



FIGURE VIII-5

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- The Ferro-Tech process utilizes refuse fed into a primary combustion chamber by means of a two or three-stage grate. The refuse is partially burned on the grates and falls into a coke-fired cupola furnace where it is completely oxidized into slag and gas. Preheated stoichiometric quantities of air are used to fire the coke.

- The Torrax process uses shredded or unshredded refuse which is charged into a vertical shaft furnace. Air is heated to a high temperature of about 1800$^{o}$F in a gas-fired refractory heat exchanger. The heated air combines with the refuse to form a combustion temperature of about 3000$^{o}$F. A secondary combustion chamber completes the burning of the gases. The gas is spray cooled and passed through a bag filter to remove particles. Slag is drained from the bottom of the furnace.

- The electric furnace process feeds refuse into a three-stage grate incinerator, where primary combustion occurs at 1800$^{o}$F. Gases are passed through a spray cooling tower and vented to the atmosphere. The ash residue is fed by an oscillating conveyor into an electric-crucible fusion furnace, at 3000$^{o}$F, that converts the residue into a fused slag.

- The oxygen-enrichment process uses bulk liquid oxygen to enrich an air-blast that burns refuse in a vertical shaft furnace. Refuse and limestone are combined and burned in suspension in the vertical shaft. Slag is drawn off from the furnace and the gases are cooled and vented.

All of the above incineration processes offer excellent future potential for disposal of solid wastes. At present, some engineers express a degree of uncertainty concerning full-scale, municipal service in solid waste disposal at the present level of operational experience.

To increase the efficiency of the incineration process, many incinerators employ pretreatment of the waste, such as shredding, before charging into the furnace. Shredding reduces the large bulky materials to smaller more homogeneous particles that burn more easily. In addition, large combustibles (tree trunks, etc.) burn more completely when the material is shredded prior to incineration. Large non-burnables, such as large appliances, refrigerators, mattresses, etc., bypass the incinerator. By segregating out non-burnables, the combustion process becomes more efficient, and often, the metallic non-burnables can be salvaged for reclamation.

HEAT RECOVERY INCINERATORS

Incinerators in France, Germany, Switzerland and other European countries have produced steam for heating and/or electric power generation for many years. In this country, there is renewed interest in capturing and utilizing the heat from the combustion process. Several installations in this country including: Norfolk Naval Base; Braintree, Massachusetts; Chicago, Illinois; and Nashville, Tennessee, utilize heat recovery from incineration.

A refuse-burning incinerator that produces and sells steam usually utilizes an auxiliary fuel to maintain the steam supply. Because of the variable nature of solid waste input, (volumes, moisture, content, etc.) steam produced solely from the combustion of refuse experiences fluctuations which hinders its marketability. If, however, the facility uses an auxiliary fuel, coal or oil, to maintain the pressure during periods of low refuse combustion efficiency, then the steam becomes more marketable. The 240-ton-per-day incinerator at Braintree, Massachusetts employs an auxiliary fuel to smooth the fluctuations in its steam production.

An incineration project in Nashville, Tennessee will utilize steam production from a refuse-burning incinerator to heat and cool office buildings. The Nashville incinerator reportedly burns 720 tons of solid waste per day to supply 22 downtown office buildings with 135,000 pounds of steam per hour to heat the buildings in the winter and drive refrigeration equipment to cool them in the summer. Steam producing incinerators are sometimes suited to large urban areas because there is sufficient solid waste to maintain the incinerator operation and markets for the steam nearby. Generally, steam can be transported about 1/2 mile before heat losses are substantial. Therefore, the facility should ideally be located as close to the steam user as possible. From a technical standpoint, there are no major problems associated with heat recovery from municipal solid waste.

PYROLYSIS

Pyrolysis is not an incineration method, but rather, a chemical process of destructive distillation, in which heat breaks down the components of solid waste into solids, liquids and gases in the absence of oxygen. Pyrolysis has been used to produce coke from coal, charcoal from wood, and coke from heavy petroleum oils. Pyrolysis produces salable end-products in the forms of solids, liquids and gases.

Pyrolysis, or destructive distillation, occurs when solid wastes are heated in a container to a temperature of about 1600$^{o}$F without sufficient oxygen to cause combustion. This process yields a gas, a liquid, a solid char, and a tar.

Some of the advantages of pyrolysis over conventional incineration include:

- The pyrolysis process is relatively non-polluting and requires only a small land area so it can be located near the population center to reduce haulage costs.
- The estimated operating cost for a pyrolysis plant is relatively low compared to incineration.

- Pyrolysis is an excellent volume reduction process. Up to 90 per cent reduction can be achieved.

- The entire pyrolysis operation is contained and, therefore, produces no air pollution if the gases are utilized.

- Pyrolysis converts most of the materials in municipal solid waste to an economically useful form. Hence, it is essentially a beneficial process from an environmental viewpoint.

The disadvantages of pyrolysis include very high capital costs and a lack of demonstrated operational experience in full scale use.

As previously mentioned, a gas is one of the by-products of the pyrolysis operation. This gas is composed mostly of hydrogen, carbon monoxide, methane, and ethylene. Reportedly, approximately 18,000 cubic feet of gas can be extracted from one ton of municipal solid waste yielding between five and eight million BTU's of available heat. The gas is a good low sulfur fuel. Tests conducted in San Diego indicated that stack emissions from combustion of the gas were below 0.2 per cent by volume as $SO_2$.

Approximately 155 pounds of solid residue is produced from one ton of municipal solid waste. The residue is a lightweight, flaky, carbonaceous char that has a fuel valve of about 11,000 BTU's per pound. The char makes a good low sulfur fuel. It can be formed into charcoal briquettes with a starch binder. It has additional uses in sewage sludge filtration and in filtration of the liquids extracted during the pyrolysis operation. The char's properties can further be enhanced by treatment with steam, $CO_2$, or air.

The liquid by-product of the pyrolysis process consists of approximately 90 percent water plus a mixture of volatile liquids, such as acetic acid, methanol, acetone, butyric acid, and other constituents, partially decomposed carbohydrates, and light oil which is a potential source of benzene and toluene. Eighty-five percent of the heavy liquids are the heavy (viscous) oil variety and 15 percent are light oils. Pilot plant studies of pyrolysis systems for processing municipal wastes have been conducted by Garrett Research and Development Company, Monsanto's Enviro-Chem Systems, Battelle Northwest, and Union Carbide. Figure VIII-6 illustrates a flow chart of a pyrolysis process.

Reportedly, Garrett Research and Development Company is constructing a 200-ton-per-day facility in San Diego County, California. The plant will recover synthetic heating fuels, glass, and ferrous metals, from mixed municipal refuse. The refuse undergoes extensive processing, including shredding, air classification, screening, and drying prior to pyrolysis.

Another prototype pyrolysis system, Monsanto's "Landgard" system, disposes of municipal solid waste while recovering glass and ferrous metal and producing steam from the waste heat. Reportedly, a 1000 ton per day pilot plant under construction in Baltimore will produce approximately 5 million pounds of steam per day.

Operating costs for pyrolysis are lower than conventional incineration and ultra-high temperature incineration. Operation of

# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

## FLOWCHART OF MONSANTO PYROLYSIS SYSTEM

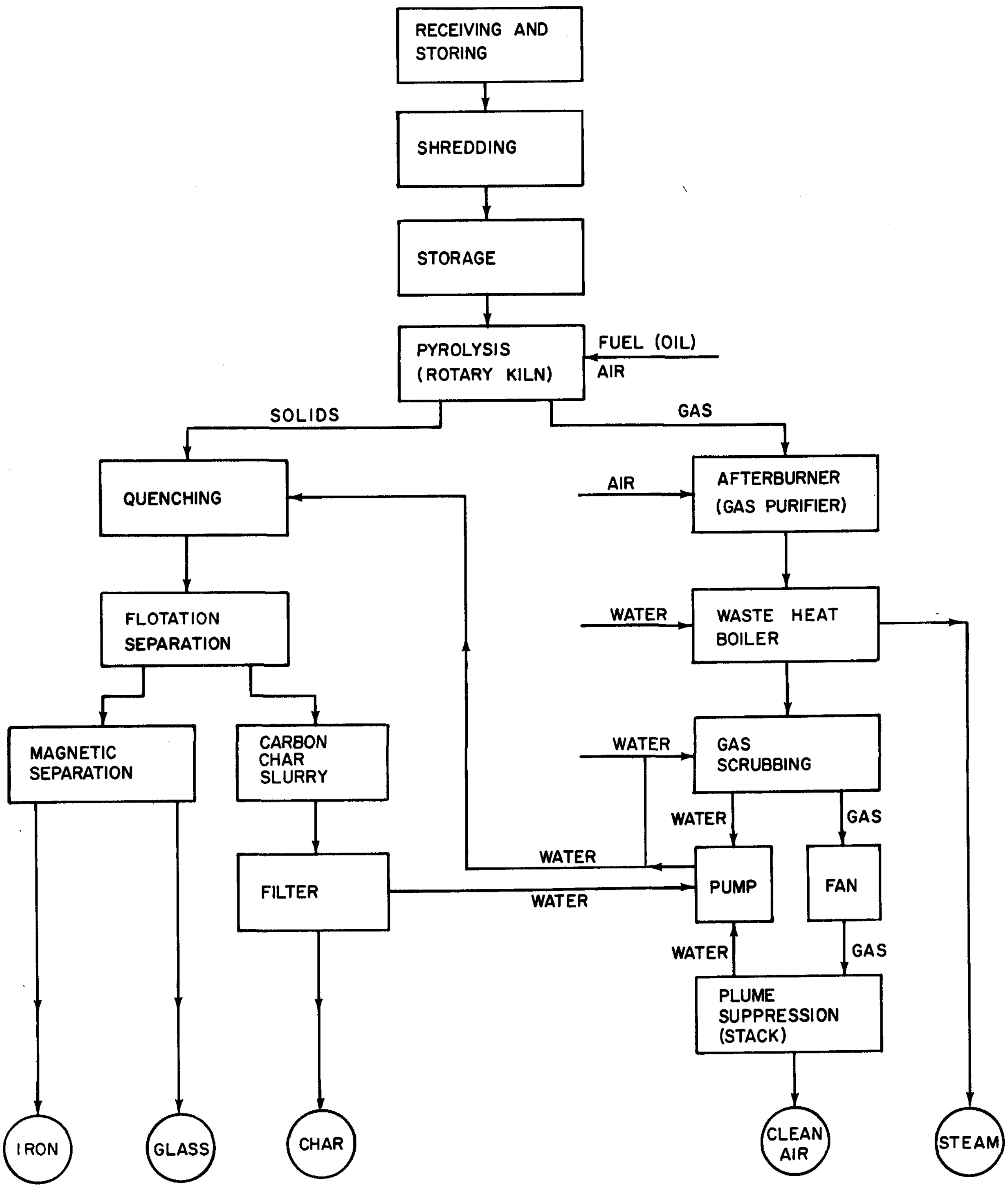


FIGURE VIII-6
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CONSULTING ENGINEERS

pyrolysis units is less critical than incineration. Pyrolysis do not vent gases to the atmosphere, and, hence, do not require air pollution control equipment.

Capital investment has been estimated, in a study by Cities Service Oil Company, to be about $16 million for a 5,000 ton-per-day unit, with an operating cost of about $4 per ton for a municipal operation. Monsanto estimates a cost of about $7.5 million for a 1000 ton-per-day facility, with a range of operating cost of $7.60 per ton to $8.25 per ton, depending on ownership and financing. Garrett Research and Development has estimated the cost of a 2000 ton-per-day capacity plant at $11.5 million. The Bureau of Mines has established the operating cost at $2.00 per ton in a 2,500 ton-per-day plant, after allowing credit for fuel recovery.

Initial pilot plant studies indicate that pyrolysis has great potential as a technically feasible method of solid waste disposal. It conserves resources by converting solid wastes into reusable materials and energy components. If pyrolysis facilities, under construction, meet expectations, pyrolysis should become a major disposal method in the future.

COMPOSTING

Composting is a method of processing solid wastes to produce a humus-like soil conditioner. Compost is useful as an additive or soil filler, but should not be considered a fertilizer.

Compost contains only about 1 percent of the primary plant nutrients which are nitrogen, phosphorus, and potassium. However, its nutrient value can be enriched by mixing with sewage sludge or chemicals.

Essentially a compost operation includes the following three steps:

1. Pre-sorting removes the non-compostable materials, such as metals and glasses. The metallic component can then be reclaimed for resale. Glass, aluminum, paper, cardboard, ferrous metals, and rags, comprising about 25 percent of the solid waste, are sorted out before the composting operation begins. The initial hand-sorting of the non-compostables has been one of the major problems with composting.

2. Organic materials are biologically stabilized by aerobic microorganisms. After the pre-sorting operation, the remaining material is shredded to reduce the particle size and produce a more homogeneous material for composting. The material is stacked in long, narrow piles, called windrows, or placed in mechanical systems. The biological process is dependent on oxygen, moisture, temperature, and nutrients for the microorganisms. The more aerobic the process, the faster the decomposition of the waste materials will be and the less odor will be produced. Mechanical systems with good air circulation and exposure require only six days to produce compost, whereas windrowing, with periodic overturning, takes six or seven weeks. Sewage sludges added to the waste can be beneficial from the standpoint of moisture, nutrients, and helping the biological process.

3. The final step is product finishing where curing, additional grinding, screening, and bagging occurs. At this stage, chemicals can be added to enhance the marketability of the final product. About 25 percent of the solid waste, by weight, entering a plant, will be rejected for the compost process. Of the remaining 75 percent, 1/3 to 1/2 of the latter becomes finished compost. Marketing of the

final product and the initial hand-sorting have been the big difficulties in the successful use of the method in the United States on a large scale. Since a large percentage of the incoming refuse ultimately is rejected, a composting operation requires a landfill for disposal of the non-compostable materials.

A 1971 study produced by the U.S. Environmental Protection Agency indicated a range of composting costs of from $3.85 to $20.65 per ton. In addition to the costs incurred in the composting facility, it must be remembered that large quantities, by weight, of the incoming solid waste (glass, metals, plastics, etc.) must be landfilled. The composting facility may or may not have a residue landfill on the premises. If not, the residues must be trucked to some other land disposal site.

Although there are many composting operations throughout the world, there is some risk in developing and constructing a composting operation. Most of the composting plants constructed in this country have closed for reasons such as odor nuisance, or a lack of market for the end product.

## HIGH-COMPRESSION BALING

High-compression baling of solid wastes is not a disposal method, but is a densification and volume reduction operation used in connection with other disposal processes such as landfilling, ocean disposal, and salvage. High-compression baling consists of the compaction of shredded or unshredded solid wastes in metal scrap baling presses or presses designed especially for solid wastes. The amount of compression and volume reduction depends on the pressure exerted by the baler or press. The optimum case of high-compression baling results in close contact between solid waste materials and the formation of a stable bale.

Metal baling presses are manufactured in the United States by a number of firms. Balers are commonly used to compress paper and scrap metals in industry. Balers built specifically for refuse compaction are manufactured by American Hoist and Derrick Company, the Japanese Tezuka Kosan Company, and a number of other firms.

Costs of metal presses, capable of providing 2000 to 3000 psi compression to refuse, with a baling capacity of about 30 tons per hour, are quoted at $250,000 to $400,000, plus freight, in a study produced by the American Public Works Association. Useful service life of equipment is considered to be 20 years. Overall power requirements may be 500 horsepower per unit or more. Annual maintenance expenditures are estimated to be less then 5 percent of the investment cost per unit. Shredding of refuse, prior to baling, does not aid in the compaction or volume reduction substantially, nor does it contribute to the stability of the refuse bale. Because of varying compositions of incoming solid waste materials, the density of bales can vary somewhat, but can be maintained over 60 pounds per cubic foot, according to best estimates.

The baling operation can be followed by several methods of disposal. The compressed bales may be used in landfilling and land reclamation operations. Transport to a landfill may be by flatbed trucks, tractor-trailers, or rail haul operations. In the event of ocean disposal, the baling operation can be located at a waterfront site next to the barge dock for ease of loading and transfer. Bales may be treated prior to disposal by enclosing in chicken wire, metal bands, dipping in hot asphalt, or wrapping the bales in vinyl.

A demonstration shredding and baling plant has been in operation in San Diego, California. The project, a joint venture between the City and the U.S. Environmental Protection Agency, began operations in September 1971. Reportedly, some 150 tons of mixed refuse are shredded and baled each day at the pilot plant. The wire-wrapped bales, weighing up to 3,500 pounds, are transported on flat-bed trucks to a sanitary landfill located in a small canyon in a public park. The bales are stacked up two layers at a time with a front-end loader which then covers the bales with a six-inch layer of dirt. Once the canyon is filled, the site will be used as an archery range.

## SOLID WASTE DISPOSAL IN THE MARINE ENVIRONMENT

Dumping of garbage and refuse in the ocean is not now practiced to any significant degree in this nation. Prior to 1933, New York City disposed of some of its solid wastes by barging them out into the Atlantic Ocean. Court actions, initiated by coastal cities in New Jersey, led to a United States Supreme Court decision in 1933 to force cessation of dumping of domestic garbage by New York City. Today, the primary sources of ocean disposal of garbage and refuse are several areas on the West Coast, canneries, and vessels (commercial and naval). Table VIII-3 shows the distribution of ocean disposal sites used in the United States.

Until recently, the U.S. Army Corps of Engineers was the agency which processed applications for ocean disposal of wastes. Their powers were based on the Rivers and Harbors Act of 1889. On October 15, 1973, the U.S. Environmental Protection Agency published their ocean disposal criteria in the Federal Register and now control the issuance of permits for ocean disposal of wastes.

In the New York Metropolitan Area, large quantities of construction and demolition debris, and sludge from sewage treatment plants are barged into a disposal area about 12 miles eastward of the Sandy Hook Light. Industrial wastes are discharged at deep-water sites designated by the U.S. Environmental Protection Agency. The sites along the Atlantic Coast are generally 1000 fathoms (6000 feet) or more deep, and over 106 miles seaward from land.

Disposal costs for barging debris and sludge in the New York Metropolitan Area depend on the length of haul and the amount

TABLE VIII-3

DISTRIBUTION OF OCEAN DISPOSAL AREAS IN THE UNITED STATES

| WASTE CLASSIFICATION | DISPOSAL AREAS Pacific | Atlantic | Gulf | Total |
|---|---|---|---|---|
| Dredge Spoil | 15 | 83* | 63 | 161 |
| Industrial Waste | 9* | 15* | 16 | 40 |
| Sewage Sludge | 0 | 2 | 0 | 2 |
| Refuse | 3* | 0 | 0 | 3 |
| Radioactive Waste | 10* | 25* | 2 | 37 |
| Explosive and Chemical Ammunition | 19* | 19* | 11 | 49 |
| TOTAL (no duplicates) | 54 | 135 | 92 | 281 |

* Areas used for two or more types of wastes

SOURCE: Ocean Disposal of Barge-Delivered Liquid and Solid Wastes from U.S. Coastal Cities, EPA 1971 of wastes handled in a particular situation. Barge size varies from 2,700 ton to 5,000 ton hopper vessels. Ordinarily, operations delayed by the weather for more than one day occur infrequently in the short hauls to the disposal area 12 miles from Sandy Hook. Barging 106 miles offshore, of course, increases, substantially, the tonnage charges.

The width of the continental shelf out along the Hudson Canyon, the eroded extension of the Hudson River, is about 120 miles from New York. Depth at the edge of the shelf, called the shelf-break, is about 600 feet. After the shelf-break, the continental slope rapidly slants downward so that, at a distance of 130 miles out, the water is about 7000 feet deep.

A number of large coastal cities have suggested ocean disposal of baled and compressed municipal solid wastes in deep water over 1000 fathoms. Another proposal was to submerge baled refuse to a depth where the hydrostatic pressure of sea water is sufficient to compress the material and cause it to become negatively buoyant. In Japan, ocean disposal of highly-compacted bales, with various types of bale covers, is being experimentally evaluated.

The major technical problem appears to be preventing materials with densities less than sea water (about 64 pounds per cubic foot) from floating. These floating materials would include wood and plastics. Ordinary refuse and garbage can be compression baled to densities greater than sea water. The Tezuka Refuse Compression System, developed by the Tezuka Kosan Company, Ltd., of Tokyo, Japan, reportedly can achieve densities over 64 pounds per cubic foot. The Tezuka bale is about 63 by 63 inches in cross-section, times a variable length from 37 to 70 inches, at densities reportedly ranging from 64 to 120 pounds per cubic foot. The bales can be enclosed with chicken wire, dipped with asphalt, wrapped in vinyl, or strapped with metal bands or wires. Once the bale reaches deep water, the large compressive forces (water pressure at 1000 fathoms is about 2,670 pounds per square inch) act to increase the bale's density and keep it permanently submerged.

The unit cost of high-compression baling and coating of the solid waste bales would be about \$1.50 to \$3.00 per ton, depending on the daily tonnage of the operation. Cost of transfer from the collection packers to the balers to the barge would vary from \$0.50 to \$1.00 per ton. A waterfront site of about 2 to 3 acres, minimum, would be required to set up the transfer and baling operations. Overall cost of the entire deep-water disposal operation, at 125 miles out-to-sea, would probably range from \$4.00 to \$5.50 per ton. Ocean disposal of baled and high-density compressed solid wastes might possibly be accomplished with environmental safety at distances past the continental shelf-break, where the baled wastes would sink to extreme depths. The full environmental consequences of such deep-water disposal are unknown. Although the deep waters are essentially devoid of biological production, there are geophysical currents that could spread soluble waste products. It is believed that dispersion of the materials would be sufficient to dilute any toxic substances to safe levels, and that carbonate and bicarbonate ion buffering will help to minimize the problem of pollution.

Current research into the ocean disposal of solid wastes and its effect on the marine environment is underway by a number of organizations, including the Dillingham Corporation, the Woods Hole Oceanographic Institute, and the U.S. Bureau of Sports Fisheries and Wildlife. As of now, these studies have not produced any definitive conclusions.

There is considerable realistic scientific concern about the potential dangers of uncontrolled waste dumping in the coastal waters of the continental shelf. It is in these shallow coastal waters, with depths generally less than 100 fathoms (600 feet), that the vast majority of the oceans' biological life is concentrated. The algae, plankton, and diatoms, which abound in the coastal waters as a result of the presence of essential nutrients brought in by surface runoff from the continents, provide the basis for the oceans' food chain, but also provide the large portion of all the oxygen produced on the earth. The great danger exists that large dumping of domestic and industrial wastes could upset the ecological balance in the waters of the continental shelf. Although sea water has a great natural buffering capacity, its ability to assimilate massive waste loading is not unlimited.

## RAIL HAUL OF SOLID WASTE

As solid waste disposal facilities continue to be pushed further and further from large population centers, the haulage cost of the refuse becomes increasingly larger. One possible solution is the use of rail haul for solid wastes being transported long distances. Conceptually, the rail haul of solid wastes from densely-populated and developed areas to remote sanitary land-filling operations is viable from an environmental and economic point of view. Practically speaking, however, the difficulties of successfully obtaining a disposal site to receive the solid waste from metropolitan areas mitigate against implementation of such a plan, unless it is sponsored by the highest levels of state or federal government.

Basically, such a rail haul plan involves the following elements:

1. A receiving station to accept solid waste materials from the collection vehicles is developed along a railroad right-of-way. The area required for the receiving station may be as little as two acres.

2. Materials handling equipment is used to transfer the solid waste into specially-designed railroad cars. In the transfer process, the refuse may be baled or shredded to increase density.

3. The solid wastes are hauled by rail to an unloading terminal on the right-of-way or on a spur. At or near the unloading terminal is a disposal facility, usually a sanitary landfill.

A report, published in August 1971, by the American Public Works Association, completed a comprehensive feasibility study on the potential of rail haul in this country. The report indicated that rail haul is feasible for solid wastes. According to the APWA, rail haul costs were significantly cheaper than truck haul.

Across the nation, several railroad companies are contemplating getting into the solid waste business. Some to the limited extent of just haulage contracts, and others, to the full extent of hauling and landfill disposal. As railroads find and acquire marginal land suitable for landfills near their right-of-way, this solid waste materials-handling technique may become implemented. At the present time, plans are being promoted in many states to utilize strip mines, pine barrens, swamps, and other waste lands as the terminal point for the solid wastes of many communities.

In mid 1973, Atlanta, Georgia and the Southern Railway System were the first in the country to enter into a contract for the disposal of baled municipal solid waste by rail haul. Reportedly, more than 2000 tons per week of refuse will be loaded on gondola rail cars. Each gondola will carry 100 tons of refuse at a unit cost of $3.75 per ton. The wastes are to be hauled about 100 miles to a 40-acre site in Macon, Georgia, where the baled bundles will be used to fill in an abandoned strip mine (using a building block approach) to its original contours.

Atlanta will construct the processing baling facility as well as the rail links. The reported cost of the facility is $1.2 million. Southern Railway will supply between 20 and 40 special rail cars, each capable of transporting 100 tons of compacted refuse.

The major obstacle to a large-scale rail haul from a large area is community opposition at the receiving end. Most counties look with disfavor on the importation of wastes from neighboring counties. Generally, a political controversy develops when one state or region wants to ship its waste to another area for disposal.

New Jersey is serviced by a number of railroads, including the Central Railroad of New Jersey, the Penn-Central Railroad, Erie-Lackawanna Railroad, Lehigh Valley Railroad, Rahway Valley Railroad, Baltimore and Ohio Railroad, and others. Some of the railroads are hauling sand, gravel and other bulk items from rural areas to the urban areas. The potential exists for a train to haul solid wastes to a disposal site, such as a gravel pit, quarry, mine, etc., and on the return trip to haul back to the urban areas some other type of payload such as sand or gravel.

The chief obstacles to successful development of a rail haul system are: 1) control of the solid wastes entering the system is required to insure economic recovery of the costs of equipment and operation; and 2) local acceptance of a rural disposal operation such as a sanitary landfill. At the present time, no multi-municipal, regional, or county-level governmental unit in New Jersey has contractual control of solid wastes in order to ensure the long-term economic stability of a rail-haul project. Such contractual control would require a franchise or individual municipal contracts in a large population area in order to achieve the necessary solid waste quantities to run the project at an appropriate scale. The problems of disposal site location are numerous. Local opposition would probably be intense. It is doubtful that successful implementation of a rail haul project can be made, now or in the next 5 to 10 years, anywhere in New Jersey.

## SEPARATION TECHNIQUES FOR MATERIALS RECOVERY

At the beginning of this chapter, size reduction (shredding) was discussed in detail. Size reduction (shredding) is the basic first step for most separation techniques for materials recovery. After shredding, the next step is to separate the various waste components for reuse or disposal.

Through the use of current technology and design, the majority of the waste materials can be recovered. Relatively simple separation techniques can be used to remove ferrous metals and the light fraction (paper and plastics). More advanced techniques can be used to separate aluminum, glass and non-ferrous metals. A brief description of some of these separation techniques follows:

- Air Classification. The first separation process, which generally follows the shredding operation, is air classification. The concept of air classification is based on the principal that certain components of solid waste can be transported in a forced air stream. The portion of the waste generally capable of being air classified includes paper and plastic and light wood or yard wastes. This light fraction accounts for between 75 and 85 percent of the volume of solid waste. By separating it from the remainder of the waste stream, a smaller percentage of material is passed on for further processing. Typically, an air classifier is a vertical column in which solid waste is introduced at the top and air is drawn up from the bottom. The lighter materials, primarily paper and plastics, are drawn up out of the column into a cyclone where the air is then separated from the light materials. The heavy materials fall down through the air classifier to a conveyor and are carried away for further processing. The velocity of the air stream through the air classifier can be adjusted to vary the proportion of light and heavy fraction exiting the classifier.

- Magnetic Separation. One of the simplest material separation techniques is magnetic separation of ferrous metal from shredded municipal solid waste. Essentially, there are two types of magnetic separators, the belt type and the drum type. The belt separator consists of a reinforced rubber belt which rotates around a magnet. Usually the magnet is suspended above the conveyor carrying the refuse in an in-line or cross-belt configuration. The magnetic particles are attracted to the magnet from the refuse and are moved to a receiving bin or secondary magnet by the moving belt. The sizes of the magnetic belts unit depends on the requirements of the installation. One disadvantage is belt wear. Generally, a belt will last from 4 to 6 months and then require replacement. The cost of a belt is usually 3 to 4 thousand dollars. Some manufacturers have designed stronger, more durable belts and one manufacturer uses stainless steel facings on the belt to reduce belt wear.

The second major type of unit is the magnetic drum. In a magnetic drum separator, a permanent magnet or electromagnet is fixed inside a stainless or manganese steel drum. Particles are attracted to the drum and are carried to a chute or a secondary magnet by the rotation of the drum. A distinct advantage of a drum separator is that the shell will last for several years without replacement. Drums are manufactured in various diameters and widths to fit most applications.

The efficiency of the overall separation process depends on several factors: 1) the type of shredder, 2) methods used to reduce paper entrapment, and 3) the type of magnetic units utilized. A shredder that crushes cans and metal into a ball tends to entrap paper. Air classification prior to magnetic separation or the use of a multiple magnetic drum system to pick up ferrous metals and drop the paper can reduce contamination substantially. The strength and configuration of the magnetic unit is of course important.

- <u>Size Classification Using Screens</u>. Particles can be separated according to size using screens. The classification procedure can be as extensive as desired by using many screens of various sizes. The process utilizes vibrating screens that are usually stacked. Particles that fall through the top screens are retained on a level below. All entrapped particles are then vibrated into holding bins. The process is effective in sorting large non-metallics, glass, bones, grit, stones, etc.

- <u>Gravity Separation</u>. Gravity separation is a general grouping which includes flotation, rising current separators, dense media separation, and stoners. Gravity separators can perform in either the dry or wet stage. These processes are considered gravity separation units because the forces of gravity and the process of flotation are both used to separate a desired constituent.

In flotation separators the wastes are transformed to an aqueous slurry and introduced into the flotation unit. Air is introduced to the tank in a saturated water solution under pressure. When released to the tank, the air comes out of solution as very fine bubbles. These bubbles adhere to the lighter fractions or treated ones and raise them to the water surface. At the surface, they are mechanically removed, while the heavier materials are removed from the bottom of the tank.

Another separation process involves heavy-media separators in which density separation divides the fractions present. The operation centers around the density of the liquid in the unit. Particles with densities greater than the liquid fall to the bottom to be collected and particles with densities less than the liquid rise to the surface to be skimmed off. The density of the liquid can be varied to selectively float certain specific materials. The rising current separator is similar to the heavy-media separator in that certain materials sink and others float. This separation process uses a rising current of liquid into which the solid waste is discharged. The action of the current carries lighter materials to the tip of the tank, where they are skimmed off and the heavier particles sink to the bottom.

A dry gravity separation unit which primarily functions on the basis of differences in specific gravity is the stoner. Other factors which affect a stoner's operation are particle size and shape. The primary application of these units has been for removal of glass and non-metalics. The basic unit is a dry vibrating table which employs upward airflow through an inclined screen or perforated table. The air carries the buoyant light particles down the table, while the motion of the table carries the heavier solids to the top. Through particle size control, and selection of feed point, the influent stream can effectively be divided into solids of low, intermediate, and high specific gravities.

- Optical Sorting. Optic sorters separate materials based on color (surface light-reflectional properties). The particles are introduced to an optical box which contains a number of photomultipliers for light, photocells, colored backgrounds, and compressed air jets. As the particles fall through the optical box, they are examined on all sides for color and compared to the colored background. If the color observed does not match the background color, one of the photomultipliers' voltage outputs will be changed. This voltage change signals the air jet and the undersirable particle is blown out a rejection chute. The acceptable particle then falls to a collection bin. The optical sorter has particular promise with respect to glass separation. By sorting glass into its three colors; clear, amber, and green, the price paid for the reclaimed glass will be increased. By operating two of these units in series, the three colors of glass can be individually separated. The only drawback to an optical color sorting process is it is yet unproven in large scale operation and its reliability has not yet been verified.

- <u>Inertial Separators</u>. Essentially, there are three types of inertial separators including, ballastic, secator, and inclined conveyor. A ballastic separator ejects material from a revolving rotor outward over a number of bins. The position of the bins is based on the ballastic properties of the solids at the velocity they are traveling when ejected from the rotor. The particle's aerodynamic and weight properties dictate how far the particles will travel before falling into a bin. Generally, the organic particles fall out first with the inorganic particles traveling the longest distance.

  A secator separator is dependent on the elastic properties of the wastes involved. The material is transported by conveyor upward and ejected outward at the top against a verticle plate. Elastic materials bounce off the plate and are deposited in a receiving bin, while inelastic materials hit and fall straight down to a revolving drum which deposits them in a second bin. The secator process basically divides the waste into heavy, resilient particles, and light, inelastic particles.

  The third type of inertial separator, the inclined-conveyor unit, functions by employing both the density and elastic properties of the wastes. Waste material is transported by conveyor to a point and then dropped onto a second inclined conveyor. The second conveyor is made up of plates which help to hold the light inelastic portion of the wastes. The light fraction is transported up the conveyor and deposited in a receiving bin. The heavier and more elastic particles will bounce and fall down the conveyor into a second receiving bin.

- <u>Advanced Separation Processes</u>. Several separation processes have recently been developed which fall under the category of chemical/thermal separation. These methods include sweating, froth flotation, and cryogenic separation. Sweating involves raising the temperature of metals to their melting points in increments to melt one metal at a time. As a metal becomes molten, it flows out of the unit, while the others pass through to higher temperature compartments. In froth flotation, the material to be separated is floated on a layer of foam at the surface of the tank.

Another process, cryogenic separation, utilizes the principle that some materials become brittle at very low temperatures. By exposing the materials to a cold substance, such as liquid nitrogen, and then subjecting them to crushing or hammermilling, the brittle ones will shatter. Then, screening or flotation can be used to separate the material. This method has potential in the disposal of automobile tires. A study conducted by the University of Wisconsin has found that when tires cooled to their glass point (-80°F) are hammermilled, instantaneous fragmentation of rubber and complete separation of cord and steel will result. In addition, the original volume of the tire is reduced 82 percent.

The final method of separation is electrostatic separation. The principle applied is that particles of like charge repel each other. In effect, the refuse is charged and fed to a drum with a similar charge. The metallics and conductors that hold a charge are repelled into one bin while non-conductors (insulators) fall into a different bin.

## TYPICAL MATERIALS RECOVERY SYSTEMS

There are a number of solid waste reduction and processing plants in the country that recover materials from solid waste. Some of the systems which illustrate the technology are described below:

Connecticut's Statewide Resource Recovery Plan. Connecticut is the first state nationwide to adopt a plan to recycle solid waste for the entire state. Plans call for the recycling of 85 percent of the state's residential and commercial solid wastes by 1985. To accomplish this goal, the state has been divided into ten regions, each having its own solid waste recycling center. Construction of the regional facilities will begin this year with two plants at Bridgeport and Berlin. These plants will be designed to recover four fractions: light fraction "fuel", ferrous metals, aluminum, and glass. Estimates show that when the entire system is operating, the resultant fuel produced will meet 10 percent of the State's power needs. After recovery of the materials, the residue which must be landfilled will amount to approximately 5 percent of the volume of the incoming wastes. The remainder of the plants are scheduled to go on stream at the rate of about one a year. Although the first two plants will employ current technology for the recovery of dry fuel as a supplement to oil fired furnaces, future plans call for the incorporation of the newest technology into the remainder of the plants. When the system is complete, there will be forty-five transfer stations, 10 processing plants, and 18 residue sites to receive wastes which can not be reused through the system.

The Bridgeport facility will receive wastes from 4 of the transfer stations in the system. Processing capacity will be 1800 tons per day, 350 days per year. Primary shredding of the wastes by two 75 ton per hour shredders will prepare the wastes for separation. The shredded wastes will then have the majority of ferrous metals removed before air classification of the combustible fraction. Heavy particles from the air classifiers, which include glass, aluminum, stones, and other impurities will be passed through special trommel screens to remove the glass and aluminum. The remaining residue will then be landfilled. The revenues from the system for Bridgeport are estimated to be $1 million per year in taxes.

Bureau of Mines. The Bureau of Mines 5 ton-per-day pilot plant in the College Park Metallurgy Research Center in Maryland, is an example of a total resource recovery system. Solid waste is delivered to the facility in compactor trucks and dumped on a concrete tipping floor. The refuse is manually raked onto the conveyor which feeds the primary shredder. The primary shredder is a flail mill that coarsely shreds the refuse. It is designed to pass heavy objects that could damage the mill. The mill is adjusted to shred the refuse just enough to liberate any entrained contaminants.

The refuse passes under a suspended-belt magnetic separator after milling. The magnetic separator removes lighter ferrous metals from the waste stream. The heavy ferrous metals, and the remaining refuse is then passed through a horizontal primary air classifier. The heavy fraction is typically composed of glass, aluminum, food wastes, leather, heavy plastics, wood, rubber, etc. The light fraction consists of paper, light plastics, leaves, etc. After separation, the light fraction is removed from the air stream by a cyclone.

The heavy fraction is passed through a rotating trommel screen. Materials smaller than 2-¼" pass through the screen and are conveyed to a water elutriator. Here, the glass is separated from the organics and is cleaned and dried. Optical sorting is used to separate the glass into amber, flint, and green colors.

Materials over 2-¼" that remain in the trommel, and the light fraction from the air classifier are fed into a secondary shredder. After secondary air classification, the heavy fraction is water-elutriated to separate the aluminum from the combustibles. The light fraction is baled.

The estimated capital costs are $3.7 million for a 500 ton-per-day 1-shift facility. The operating costs were estimated to be $3.91 per ton for the 500-ton-per-day plant. Figure VIII-7 illustrates the Bureau of Mines recovery system.

Aluminum Association. Reportedly, the Aluminum Association has plans for the development of total resource recovery systems for solid waste. Incoming refuse would be unloaded in an industrial type building. The refuse is shredded to increase homogenity and reduce bulky materials. Magnetic separation then recovers the ferrous fraction for reclamation. The non-combustibles would be screened, then air classified. The heavier materials, including glass, organics, non-ferrous metals, dirt, etc., would be water elutriated to reclaim the glass, aluminum and organic wastes. The glass would be further optically separated by color (clear, amber, or green). If a market for paper fiber was available, the light fraction could be utilized for fiber reclamation. If the market was depressed, then it could be incinerated with the remainder of the combustible fraction with possible heat recovery. Reportedly, a 500-ton-per-day facility would require approximately 10 acres

# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

## FLOWCHART OF BUREAU OF MINES MATERIAL RECOVERY SYSTEM

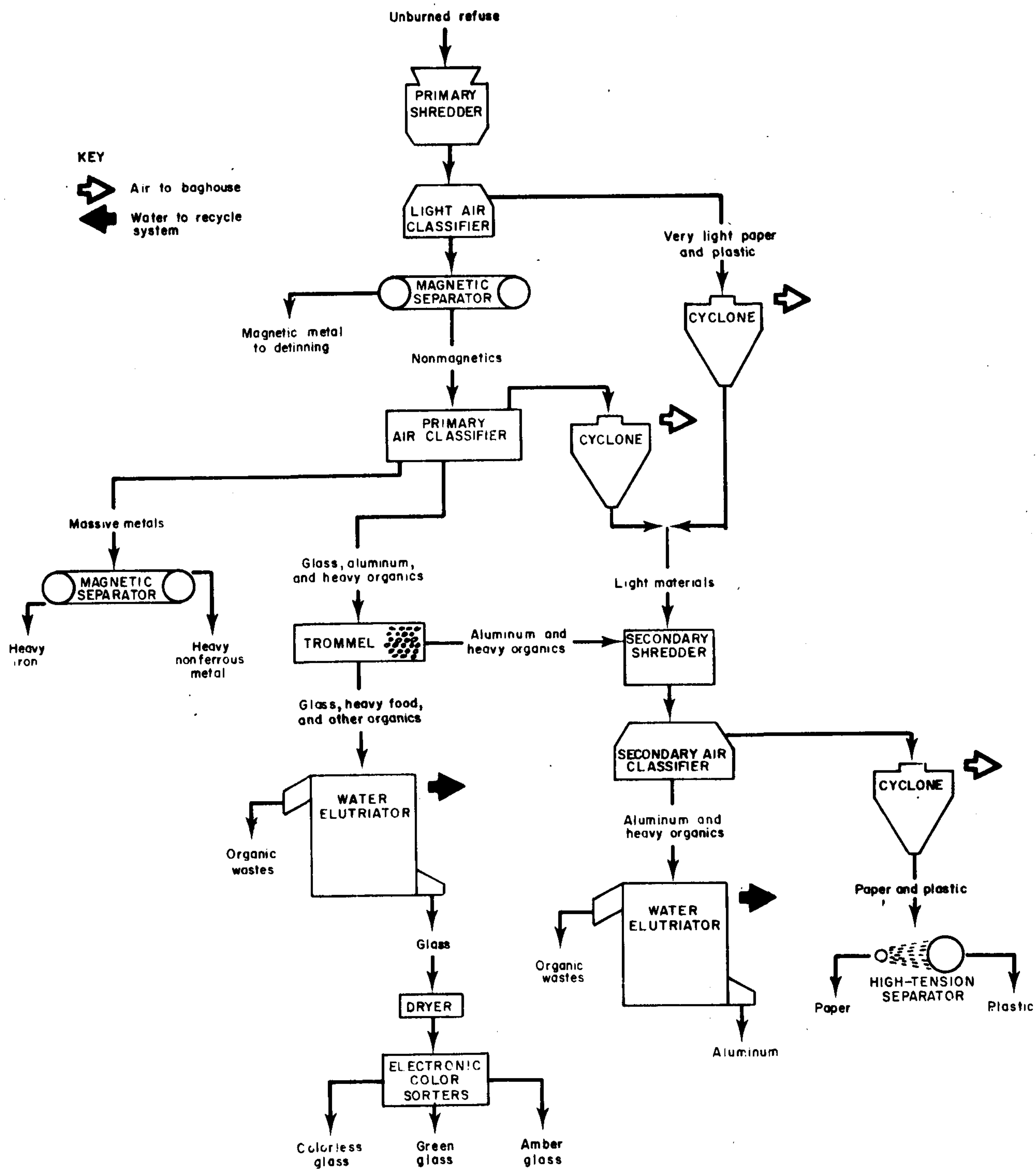



FIGURE VIII-7

M. DISKO ASSOCIATES
CONSULTING ENGINEERS

Source: Bureau Of Mines, Publication No. 7760 of land, a capital investment of about $15 million. The operating costs would depend on local markets for recovered materials.

Black Clawson. The City of Franklin, Ohio and the Black Clawson Company have been recovering materials in a resource recovery facility since 1971. The 150 ton-per-day facility was designed to accept the solid waste from the City of Franklin and three surrounding townships until 1990. The refuse is delivered to the facility by packer collection trucks. It is dumped onto a concrete tipping floor where a front end loader selectively loads the feed conveyor. Large items such as engine blocks and concrete chunks can be segregated out by the front end loader.

The refuse is next transported to the Black Clawson Hydropulper which is 12 feet in diameter and is powered by a 300 HP motor. The hydropulper grinds all pulpable and friable materials into a water slurry of 3½ percent solid content.

The pulper shreds all "soft" refuse, however, "hard" materials, such as tin cans, metallics, rocks and stones and other non-pulpable materials are ejected from the pulper. A bucket elevator collects the rejected materials and passes them through a washing area. The ferrous metals are magnetically extracted after washing. All washing and processing waters are recycled for reuse in the hydropulper.

The slurry exiting the hydropulper contains all of the organics, glass, small metallic pieces, and paper fiber. The heavy, inorganic component is removed from the slurry by high speed centrifugal action. These materials undergo further processing to separate the aluminum, heavy plastics, glass, and non-ferrous metals. The glass is optically separated into amber, flint and green fractions.

The slurry mixture, now freed of metallics, glass and other plastics, is pumped to the Black Clawson Fibreclaim process. In this stage, a series of screens removes the long paper fibers from the coarse organics. After the material is dewatered (95% of water removed), the remaining residue (40% - 50% by dry weight) is available for reuse in the paper manufacturing industry. The organics, rubber, textiles, year wastes, and other non-recoverable components, separated from the paper fibers in the screening process, are dewatered to approximately 40 percent solids. The resulting pressed cake is broken up into small pieces ranging from 5/8 to 1-½ inches. These pieces are blown into a high-temperature fluid-bed reactor for incineration. The exhaust gases are scrubbed and all residue from burning is landfilled. Reportedly, the organics have a heat value of from 7500 to 8000 BTU's per pound. A large facility, modeled after the Franklin plant could couple a waste heat boiler to the fluidized bed combustor for the recovery of energy in the form of steam or electricity.

Black Clawson estimates that net capital recovery and operating costs will range from $4.00 to $4.50 per ton for a 200 ton-per-day facility. The costs include revenues realized from the sale of recovered components. Capital cost for a 200 ton-per-day plant is, reportedly, about 3 million dollars. A schematic of the Black Clawson process is illustrated in Figure VIII-8.

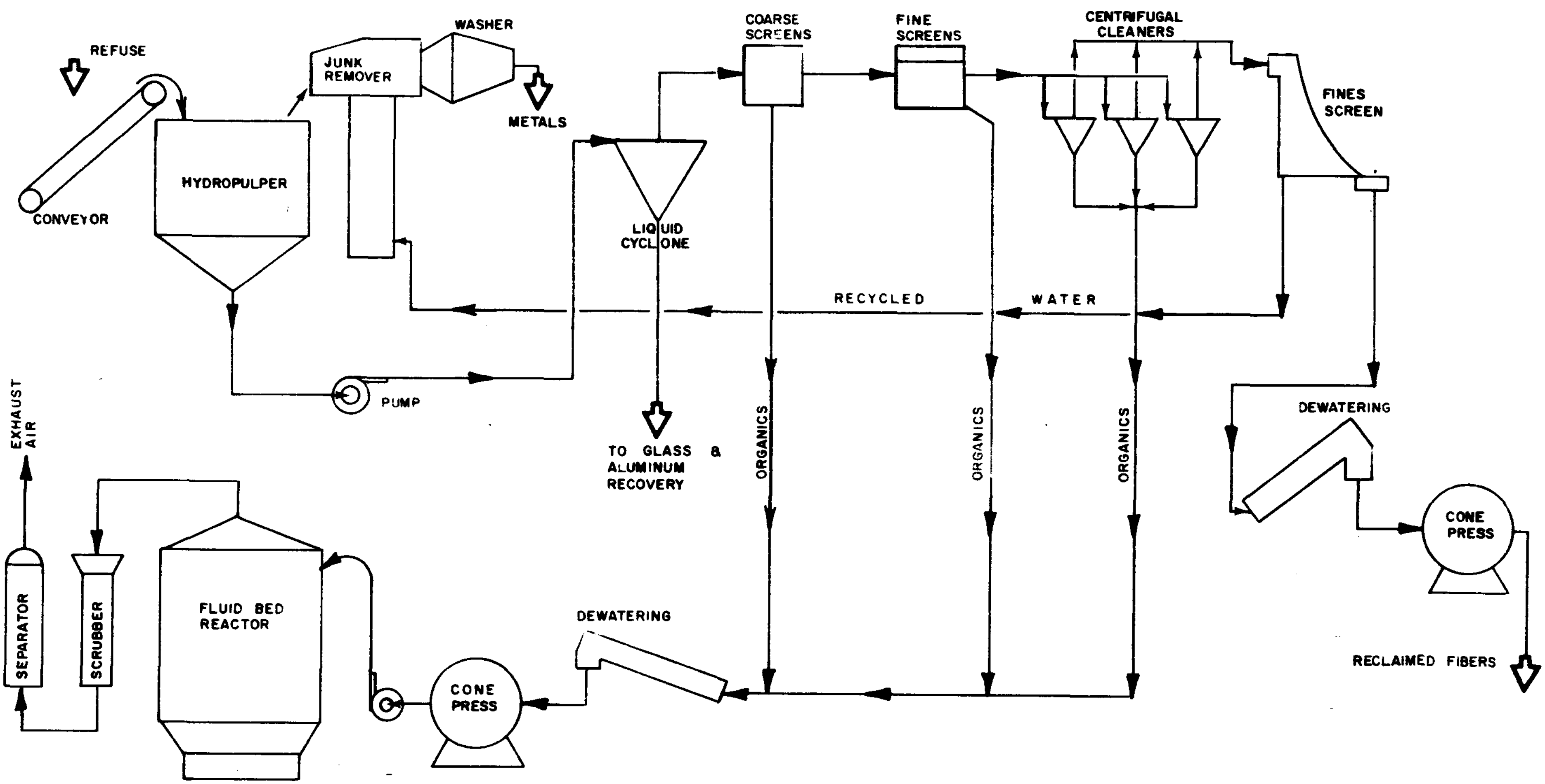
New Orleans. A total resource recovery facility is under construction in New Orleans, Louisiana which will separate aluminum, ferrous metals, color-sorted glass and newspaper for resale. The operation is a joint effort between the City of New Orleans, the National Center for Resource Recovery and a private firm, Waste Management, Inc., who will be the owner/operator of the 750 ton-per-day plant.

In August 1974, the City and Waste Management, Inc. signed a 12-year contract in which the City agreed to pay $10.95 per ton of refuse delivered to the Waste Management, Inc., recovery facility. In addition, the City will share in the profits from the sale of the recovered materials. The first stage of construction, which includes shredding, separation of certain materials, and operation of the landfill, is slated for completion around the first quarter of 1976. The second stage, which includes the bulk of the resource recovery equipment, will be completed near the end of 1976.

Solid wastes delivered to the facility by City collection trucks

# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

## FLOWCHART OF BLACK CLAWSON MATERIAL RECOVERY SYSTEM




SOURCE: BLACK CLAWSON

FIGURE VIII-8

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will be hand picked to remove pre-bundled newspaper, corrugated and certain large items to be shredded separately. The refuse then passes through a trommel screen which opens plastic and paper bags. The trommel also separates much of the glass and other small materials. The glass is recovered in large enough pieces to facilitate color sorting and reduce shredder wear. The refuse is then shredded to reduce the particle size and increase homogeneity. Air classification follows, with the "light" fraction being sorted and separated to provide a stable landfill material for reclamation of low lying marshland in the City. The "heavy"fraction is channeled through a screening process to separate the glass fines, grit, and stones. A rising current separator, using a current of water, washes the refuse and removes heavy organics such as wood, heavy plastics, and food wastes.

The heavy components are then passed through a magnetic separator in which the iron and steel are separated from the refuse. Heavy media separators separate any remaining organic material and divide the waste stream into two branches: one of aluminum and glass, and one consisting of the remaining non-ferrous metals. Electrostatic separators then separate the aluminum and glass components. The glass is optically color sorted into flint and mixed glass.

The New Orleans resource recovery facility will be a test-bed for the U.S. Environmental Protection Agency and evaluation and results of experiments conducted on the varous unit operations will be available to the public. Figure VIII-9 illustrates the New Orleans' resource recovery schematic.

American Can Company. American Can Company's "Americology" resource recovery system separates refuse into two re-usable fractions. The materials fraction can be processed for ferrous metal, glass and aluminum reclamation and the "light" paper fraction has a potential use as a supplemental fuel in large steam or heat producing boilers.

Refuse delivered to the plant is dumped on a large concrete tipping floor. A front-end loader pushes the refuse into a conveyor. A manual picking station allows specially identified plastic bags containing newspaper to be sorted out of the waste. The bags, supplied to the homeowner, enable the paper to be easily spotted in the waste, and protected from contamination. The newspaper is baled for delivery to a paper manufacturer for re-use. The remaining refuse is then conveyed to a shredder. The shredder is housed in a sound-proofed enclosure to reduce noise levels in the plant. The enclosure also has dust control apparatus. A 500 ton-per-day facility has a shredder feed rate of about 60 tons per hour. After shredding, the waste steam is divided into two 30 ton-per-hour streams for air classification.

Two zig-zag air classifiers, one on each waste stream, separate

# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

## NEW ORLEANS RESOURCE RECOVERY PROCESS SCHEMATIC

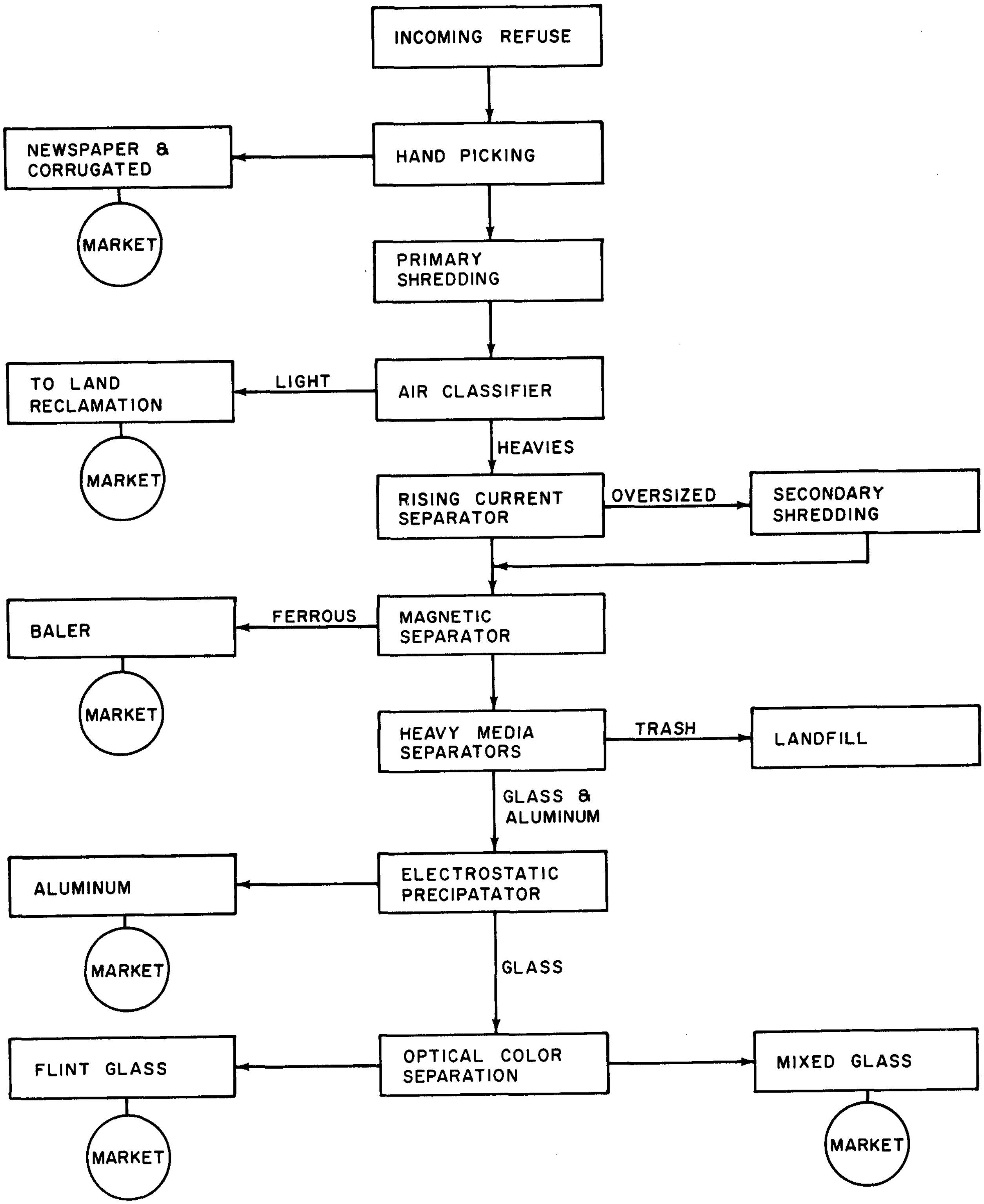


FIGURE VIII-9

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the refuse into the two fractions. The "light", fuel fraction typically contains the paper, light plastics, light wood, leaves and other combustible materials. The material is packed into transfer trailers for haul to a large industrial or utility boiler as a supplemental fuel.

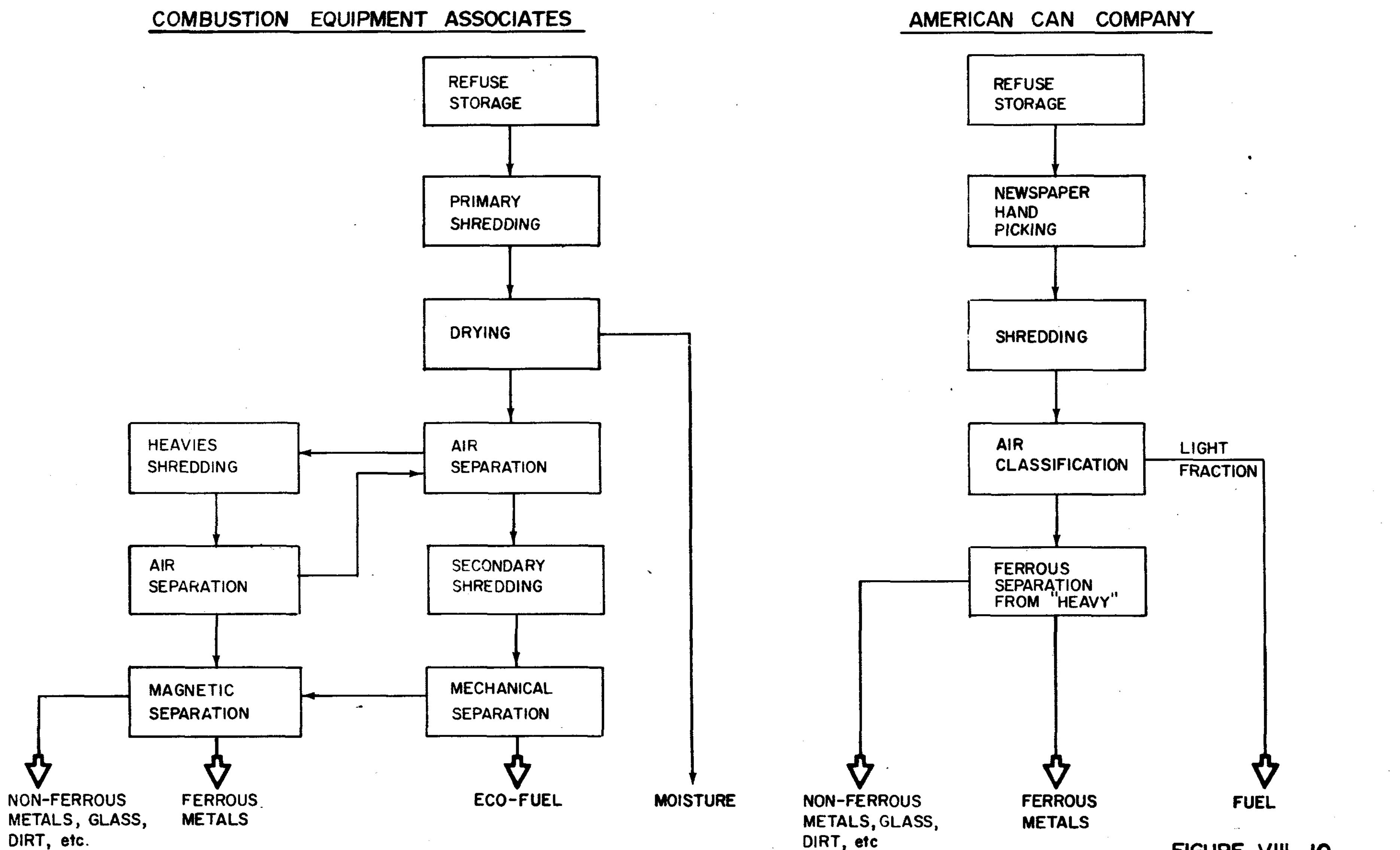
The "heavy" fraction, which typically includes the aluminum, ferrous metals, glass, stones, dirt, etc., is further processed to separate the ferrous metals, aluminum, and glass. All ferrous metals reclaimed are utilized by American Can Company's de-tinning subsidy, M & T Chemicals, Inc., in Elizabeth, New Jersey. All residue is landfilled.

The Company estimates capital costs at about \$3.5 million dollars for a 500 ton-per-day modular unit. The operating costs range from about \$6 to \$10 per ton depending on facility ownership. The solid waste recovery operation is industrial in nature and can be located on as little as 2 acres of land for a 500 ton-per-day operation. Company officials indicate that about 80% by weight of the incoming refuse can be recovered. Figure VIII-10 illustrates the American Can Company process.

Combustion Equipment Associates. The Combustion Equipment Associates resource recovery facility recovers ferrous metals and the "light"fraction of solid waste for use as a supplemental fuel. Incoming waste is dumped on a tipping floor and conveyed into a shredder. The shredded refuse is then dried. The drying

# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

## MATERIAL RECOVERY WITH SUPPLEMENTAL FUEL RECOVERY




Source: Combustion Equipement Assoc.

FIGURE VIII - 10

M. DISKO ASSOCIATES
CONSULTING ENGINEERS

process enhances the fuel valve and aids air classification. Air classification follows the drying. The light fraction then undergoes secondary shredding and it is treated for odor and decay control. It is then ready for use as CEA's supplemental fuel, "Eco-Fuel."

The "heavy" fraction is shredded a second time. Magnetic separators remove all ferrous metals for reclamation. The remainder of the heavy materials, including the non-ferrous metals, glass, heavy plastics, etc., can either be further classified for materials separation or can be used as an inert landfill material.

Combustion Equipment Associates has a facility in operation in East Bridgewater, Massachusetts. The 1200 ton-per-day plant produces Eco-Fuel for sale to the Weyerhauser Paper Company. The "Fuel" is hauled some 60 miles in refuse transfer trailers.

Company officials indicate a 1000 ton-per-day facility is the minimum they will construct. Based on that assumption and the reported 14.2 percent residue from their process, a landfill capable of accepting 140 to 150 tons per day of residue from a 1000 ton modular facility must also be developed. The East Bridgewater facility reportedly had a capital cost of $9 million. The tipping fee charged to the municipalities using the facility is $9.25 per ton. Figure VIII-10 illustrates the Combustion Equipment Associates process.

ENERGY RECOVERY FROM MUNICIPAL SOLID WASTE

The heating value of the shredded, air-classified solid waste is about 5000 BTU's per pound (10 million BTU's per ton). The BTU value flucuates with the moisture content of the refuse. If the light fraction is dryed prior to shipment to the user, the fuel value is more consistent and greatly enhanced. The value of the solid waste as a fuel depends on several factors. The type of fuel it replaces (oil, coal, or gas), the cost of modifying the boilers, and the cost of firing the waste into the furnace must all be taken into consideration when accessing a net value for the waste. The processing of this "fuel" utilizes existing technology and commercially available equipment. A typical process is outlined below.

- Receiving or Unloading Area. Solid waste is discharged onto a tipping floor where front-end loaders push the refuse onto conveyors which feed the hammermill. The tipping floor allows large, non-shreddable materials to be segragated out. The front-end loader also requlates the input to the conveyors.

- Shredder. The shredder pulverizes all incoming refuse to a particle size about 2 to 3 inches square. The small size is required, but necessitates almost daily re-tipping of the hammers. To reduce hammer wear, two stage shredding with air classification is sometimes used. In this case, the first shredder would reduce the particle size of the refuse to about six inches. Secondary shredding would then reduce the refuse to the desired inch particle size.

- Air Classifier. After shredding all refuse is fed to an air classifier. Here, the heavier, non-combustible fraction of the solid waste is separated from the lighter combustible materials. The air classifier is a vertical shaft in which refuse is introduced at the top and air is blown up from the bottom. The lighter materials are carried up and away to storage and the heavier materials drop to the bottom for further processing. By removing the heavier components, several benefits are achieved. The heating value of the light "fuel" fraction is increased since metals, glass, and other non-combustibles are removed. Also, the transport of the material and the injection of the solid waste into the boiler is enhanced, and the quality of the resulting bottom ash is improved because the concentration of non-combustibles is greatly reduced

- Transportation. The light fraction is transferred to the power utility or industrial user by transfer trailers. The transfer trailers, each with a capacity of about 17 tons, unload the waste into a storage bin on the utility's or industry's property. The storage of the waste allows the user to provide an even flow-rate to the boilers.

- Materials Recovery. The heavy fraction, comprising most of the metal, glass, dirt, and other non-combustible materials is further processed. Ferrous metals are magnetically removed for subsequent sale. Glass can be removed by vibrating screens. Heavy media separators can be used to remove non-ferrous metals such as aluminum. All non-usable residue is landfilled. At this point only a relatively small volume of material need be landfilled, since the bulk of the solid waste has been processed for energy recovery or fuel use.

Capital and operating costs for a system using solid waste as a supplemental fuel fall into three main categories: processing, transporting, and firing.

The processing facility would receive, convey, shred, classify, and prepare the solid waste for shipment to the power utility or industrial user. The capital and operating costs for the processing facility naturally vary with the capacity and throughput volume. For example, a facility which would include two-stage shredding and air-classification, with a 250 ton-per-day volume would have a capital cost of about $2,000,000. A similar facility, with 500 ton-per-day volume would have an expected capital cost of about $3,5000,000. The costs to the community also vary with the method of ownership of the facility and the method of financing. Additional costs incurred include labor, maintenance, and utilities. Generally, operating costs would range about $4.00 to $6.00 per ton for the facility. If ferrous metals are extracted, a possible revenue of $1.00 per ton of raw refuse can be obtained with a corresponding drop in operating costs.

Transportation costs are important because they must be deducted from the market value of the ferrous metal or light "fuel" fraction to get actual net revenue. Obviously, revenues realized from reclamation of various components of solid waste can be partially consumed by long transportation haul distances.

The costs of firing the solid waste and of converting an existing boiler for solid waste use vary with the type of boiler. Generally, the power utility or industrial user would finance the necessary modifications since it would be installed on the user's property. Tangentially fired boilers require minimal capital expenditure for modification because of the port design. Horizontal and cyclone fired boilers require a more complicated modification and the costs could be expected to be greater.

The principal factor affecting the cost of the firing of the waste fuel is the main fuel supply. For example, if the solid waste were fired in conjunction with pulverized coal, a moderate increase in operating cost could be expected. If, however, natural gas or oil were used as the primary fuel, a significant cost increase could be expected because of the added bottom ash-handling resulting from the solid waste.

A supplemental fuel facility that has received much attention is the St. Louis, Missouri - Union Electric Company joint venture. Started in April 1972, the process provides two Union Electric Company boilers at their Meramec Plant with about 12.5 tons of refuse per hour, or 300 tons per 24-hour day. The "fuel" is derived from a series of volume reduction and weight classification stages. The fuel is delivered to the Meramec Plant 24 hours a day, 5 days a week by transfer trailers. The refuse, injected along with pulverized coal into the boilers, has a particle size of about 1-½ inches. The St. Louis project was originally designed to utilize 10 percent light fraction with 90 percent coal. However, the Meramec boilers have operated satisfactorily with 15 percent solid waste and company officials estimate 20 percent light fraction concentration to be feasible.

The present plans for the joint venture include a $70 million expansion. Union Electric Company plans to expand to handle about 3 million tons of waste annually from a 4500-square mile region. The utility is considering converting two additional power plants to allow refuse burning as a supplemental fuel.

Extensive testing and monitoring of the boiler condition and stack emissions resulted in some surprising results. The air pollution parameters most often measured in relation to stack emissions, sulfur dioxide and nitrogen oxides concentrations, have actually decreased with the addition of the low-sulfur solid waste fuel to the furnaces. The effects of the solid waste burning on the boilers has also been minimal. Slagging was not found to be a problem, and the ash content is in the 10 to 15 percent range. The performance of the boilers with the solid waste being burned is essentially the same as the "coal-only" performance.

Direct utilization of solid waste in heat recovery incinerators has been in successful operation for a number of years in France, Germany, and Switzerland. Steam produced in these incinerators is used for heating and/or for the generation of electricity. In recent years, heat recovery incinerators have been utilized in a number of installations in the United States, including the Norfolk Naval Base; Braintree, Massachusetts; Chicago, Illinois; and Nashville, Tennessee.

The Nashville, Tennessee incinerator, for example, provides steam to commercial buildings. The Nashville incinerator burns 720 tons of solid waste a day. The refuse supplies energy to two boilers that generate 135,000 pounds of steam per hour.

The steam will be used to heat 22 new office buildings in Nashville in the winter, and it will drive the refrigeration equipment to cool them in the summer. The plant is designed to be expanded to incinerate approximately 1500 tons of refuse per day.

The Hackensack Meadowlands Development Commission, working with Combustion Equipment Associates and SCA is planning a shredding system which will utilize steam produced by burning the solid wastes. The facility would be located in the Hackensack Meadowlands.

# IX. UTILIZATION OF SOLID WASTE TRANSFER STATIONS TO REDUCE HAULAGE COSTS

## GENRAL CONCEPT

Solid waste transfer stations are an effective means of reducing the costs associated with hauling solid waste to disposal sites. As solid waste disposal sites are pushed further and further away from the centers of refuse generation, municipalities and counties are utilizing transfer stations to reduce and/or stabilize the costs of solid waste haulage. Figure IX-1 shows a photograph of a typical municipal solid waste transfer station in Summit, N. J.

A transfer station is not a disposal method, but a facility with the primary function of providing for economical transfer and haulage of solid wastes to the disposal site. The concept of transferring waste from many smaller collection vehicles to large-capacity transfer vehicles can be an economical solution to rising haulage costs. The savings, however, must recover the cost of owning and operating the transfer station and transfer vehicles.

Typically, a transfer station is a building in which regular collection trucks (10 to 25 cubic yards) dump the solid waste and return to the collection route. The refuse is then hydraulically packed into large (60 to 75 cubic yards) transfer trailers which make the long haul to the disposal site.

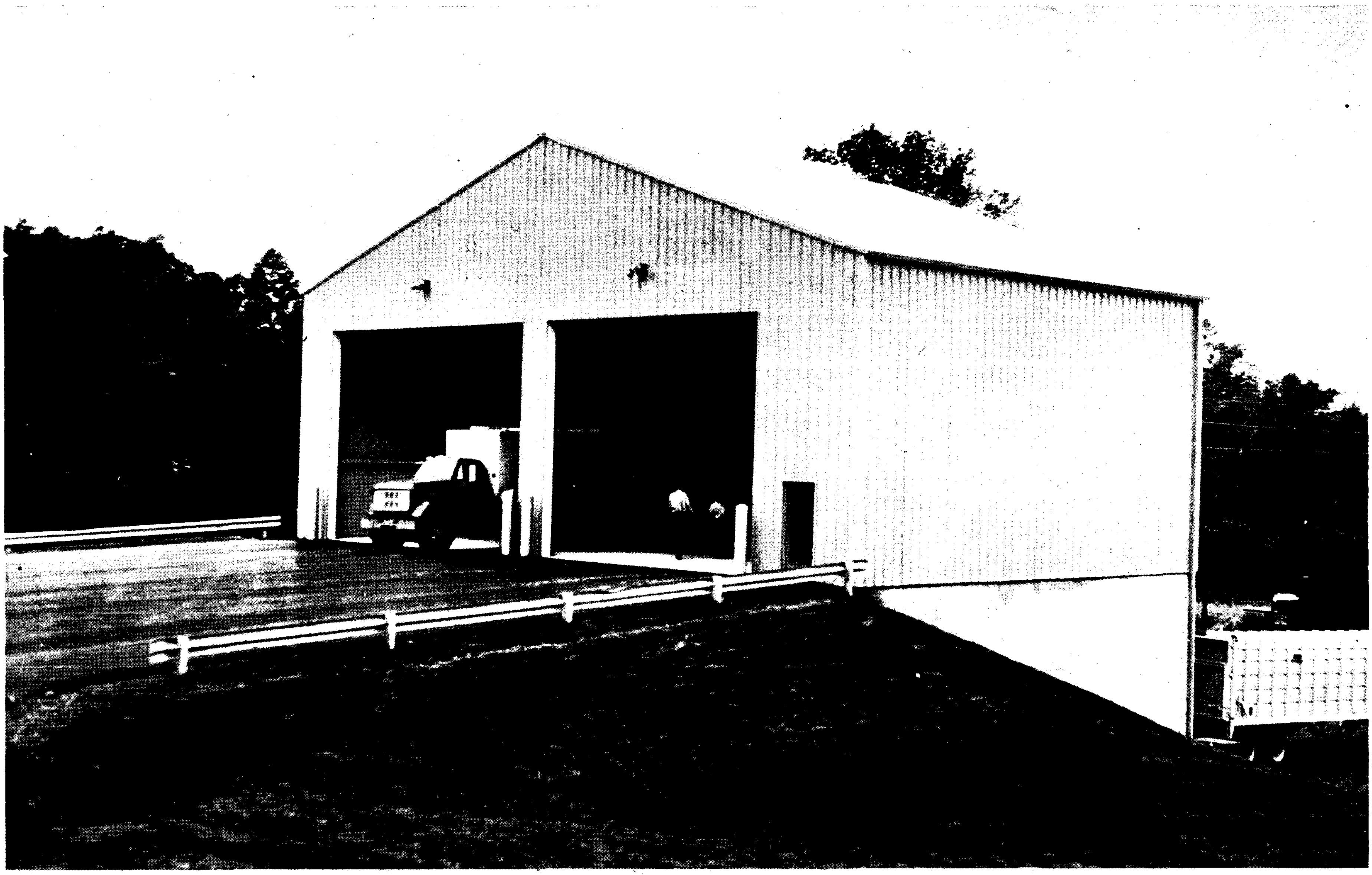


FIG. IX-1 MUNICIPAL REFUSE TRANSFER STATION IN SUMMIT, NEW JERSEY

CONSTRUCTED IN 1971, THIS TRANSFER STATION IS A CLEAN, ECONOMICAL OPERATION THAT HANDLES ABOUT 150 TONS OF SOLID WASTES EACH WORKING DAY. THE TRANSFER STATION, WHICH SERVES A COMBINED POPULATION OF 37,300 IN TWO MUNICIPALITIES, WAS DESIGNED BY M. DISKO ASSOCIATES.

Savings from utilization of a transfer station are realized in the reduction of haulage costs. Disposal costs will not be affected. Greater efficiency is realized in collection because the packer trucks spend more time collecting the refuse while transfer trailers make the haul to the disposal site.

Some of the costs incurred for the construction and operation of a solid waste transfer station include:

- The capital expenditures for land, structures, and equipment;
- The labor, utilities, maintenance, and overhead costs at the transfer facility;
- The labor, operating, maintenance, and overhead costs incurred in the waste hauling operation.

When a municipality or county is forced to make a long haul to a disposal site, the construction and operation of a transfer station has many advantages. Some of these advantages are outlined below:

- Haulage costs to the disposal site are reduced because the number of smaller trucks hauling to the disposal area is reduced. This, in turn, reduces truck wear and tear, and maintenance costs. In addition, it allows the packer trucks to quickly return to the collection routes.
- Labor costs are reduced because the driver of the transfer trailer is the only person that makes the time-consuming trip to the disposal site. After the collection truck, with it's one, two, or three-man crew, finishes loading, it drives to the centrally located, close-in transfer station, empties it's waste load, and immediately returns to the collection route.

- The transfer station can be housed in an attractive building that allows the collection trucks to dump where odor, dust, and noise can be controlled. This allows a transfer station to be a good environmental neighbor that can be easily located on small acreage in an industrially or commercially zoned area.

- The relatively small size enables the transfer station be built on small land parcels. Stations can be built on as little as 2 acres, but 5 acres is preferred to include buffer areas.

- The number of collection trucks passing through other municipalities on route to the disposal site is reduced. Instead, fewer, less conspicuous transfer trailers pass along the major highways.

- Clean-up services are improved and costs reduced. The central facility can also be used by residents to dispose of bulky wastes, trash, etc.

- A transfer station offers a municipality flexibility in the event of being closed out of a particular landfill or disposal site. The municipality or region can haul to another site without major re-routing difficulty.

## TRANSFER STATION EQUIPMENT COMPONENTS

There are a number of companies that manufacture transfer station equipment, including American Hoist and Derrick Company, Dempster Brothers, Inc., The Heil Company, E-Z Pack, Hobbs Trailer, Elgin Leach Corporation, Pak-Mor Hemisphere Corporation, Western Body and Hoist Company, and others.

The basic components of solid waste transfer station systems are described below:

- Hopper. The hopper is a steel container into which the collection vehicles dump their refuse loads. The hopper may be used to funnel solid wastes directly into a transfer trailer, or to feed a stationary packer which compacts refuse into a transfer trailer or roll-off container. The hopper generally has a volume of 10 to 30 cubic yards.

- Transfer Packer or Stationary Packer. The packer consists of a charging box into which solid waste is deposited by gravity from a hopper. Supported by a steel frame, the packer head is moved by a double-acting hydraulic cylinder. The packer head forces the solid wastes into the transfer trailer or roll-off container which is coupled to the stationary packer. Different size packers are used with transfer trailer and roll-off containers. The units are generally not interchangeable. Under the piston-like action of the packer, solid wastes are crushed and compacted into the transfer trailer or roll-off container. The stationary packer is powered by an electrically-driven hydraulic system. A complete cycle of the packer's piston usually takes less than 1 minute to pack refuse and return to the initial position.

- Compaction Transfer Trailer or Transport Trailer. The transfer trailer generally is built in a 60, 65, or 75 cy. yd. size, but other sizes are available. One type of trailer can be charged with solid wastes directly by gravity through a hopper into an opening in the top of the trailer. Solid wastes are moderately compacted by means of the pressure-plate ejection apparatus. A second type of trailer couples directly to the stationary packer. Use of the packer to ram solid waster into the trailer achieves high compaction. Some manufacturers make a unit that can be used either with a stationary packer or with an overhead hopper. The pressure-plate ejection apparatus is hydraulically operated from a power system provided by a wet-line connection to the tractor, or an auxiliary gasoline engine, mounted on the trailer. In New Jersey, the maximum gross weight of the loaded tractor-trailer must not exceed 73,280 pounds, plus a 5% tolerance, for a 5-axle rig, or 63,400 pounds, plus a 5% tolerance for a 4-axle rig.

- Tractor Unit. A heavy-duty tractor must be used to drive the transfer trailer. The diesel unit must be capable of handling the loaded transfer trailers in the difficult driving situations encountered at a sanitary landfill operation.

- Hydraulic System. The hydraulic system is used to power the cylinders in the stationary packer. The system is a complete, packaged unit, generally mounted on a steel frame. A high-pressure hydraulic pumping system is powered by an electric motor which can be as large as 60 HP. Power requirements are 220/240 volts.

- Push-Pit. A push-pit is essentially a trench or channel-like opening in the unloading floor of a transfer station. The push-pit is fitted with guide channels and a traveling, hydraulically-powered push-plate. Solid wastes are dumped from several smaller vehicles into the push-pit. The solid wastes are then pushed into a hopper where they fall into the charging box of the stationary packer. The main advantage of the push-pit is that it allows two or more smaller vehicles to unload without waiting to dump directly into the hopper.

- Roll-Off Container. Roll-off containers are detachable, steel, rectangular-shaped containers. Their length generally ranges from 16 to 20 feet. Capacities range from 19 to over 40 cubic yards. Roll-off containers come with either a closed-top or an open top. The closed-top unit is made for use with a stationary packer. The roll-off container is constructed of reinforced steel plate and is picked up and transported by a tilt-frame trailer vehicle.

- Tilt-Frame, Hoist-Haul Tractor. A tilt-frame tractor vehicle is used to unload the container, hoist the container onto the vehicle frame, haul the container to the disposal site, and dump the contents of the container. Essentially, the tilt-frame is a heavy-duty hoist or winch system which is mounted on a truck body. A typical unit is capable of hoisting up to 30,000 pounds of container and solid wastes. The truck is normally a 3-axle unit. Gross weight limits for a 3-axle rig in New Jersey are 53,800 pounds, plus a 5% tolerance.

- Conveyor Systems. Conveyors are sometimes used to lift solid wastes into a hopper. The use of the conveyor eliminates the need for ramps and retaining walls necessary for a two-level gravity-dump operation. The conveyor systems are proven in use and are reliable. Use of a conveyor system in certain cases may reduce the construction cost of the transfer station. Normally, the width of the conveyor used would range from 4 feet to 6 feet, with the length as necessary to achieve the lift desired.

There are various layouts that can be utilized for a transfer station operation. Some of the most common systems are illustrated in Figures IX-2 and IX-3 and are described below:

System A The single level system illustrated is well suited to areas where a two story building would not blend with existing land use or zoning. This system is unique in that a conveyor is utilized to lift the refuse from the unloading floor to the charging hopper. Wastes brought in by the packer collection trucks are dumped directly on the conveyor or on to a concrete tipping floor where a front-end loader selectively pushes the refuse onto the conveyor. The reinforced conveyor lifts the refuse up to a hopper which feeds a stationary packer. The hydraulic packer rams the refuse into a transfer trailer.

System B This transfer layout is common in two story transfer stations. It is a two level operation in which packer collection trucks and transfer trailer operations are separated. Incoming waste is dumped on the upper level either directly into the hopper or onto a tipping floor where a front-end loader would then push the refuse into the hopper. The wastes are compacted into the transfer trailer by the hydraulic stationary packer, which is situated on the lower level. Although a larger building is required, the costly conveyor used in System A is eliminated. This two story setup is well suited to sloping terrain.

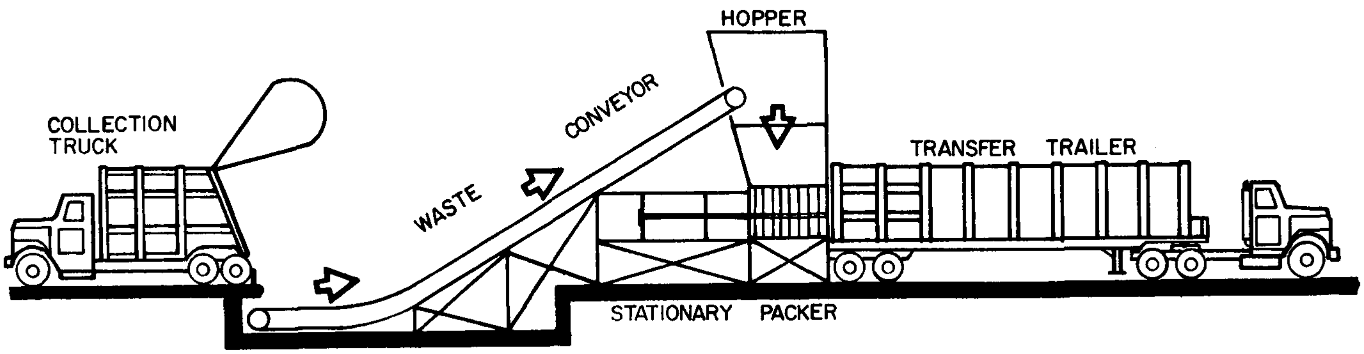
System C This transfer station design does not necessitate additional equipment other than the trucks and transfer trailer. The packer collection trucks enter the top level of the station and dump their refuse directly into the top of the transfer trailer located on the bottom level. A ram inside the trailer then pushes the refuse against the rear doors to achieve a mild compaction. One advantage of this system is that the transfer trailers can "drive-through" the station without being required to back-up. At the landfill, the rear doors are opened and the same internal ram ejects the refuse out the rear.

System D System D is a low volume transfer operation in which refuse is compacted by a stationary packer into a closed top roll-off container. The container is serviced on a regular basis by a tilt-frame truck. As with Systems B and C, the building is two stories high, and may not be justified if the station has a small through-put volume.

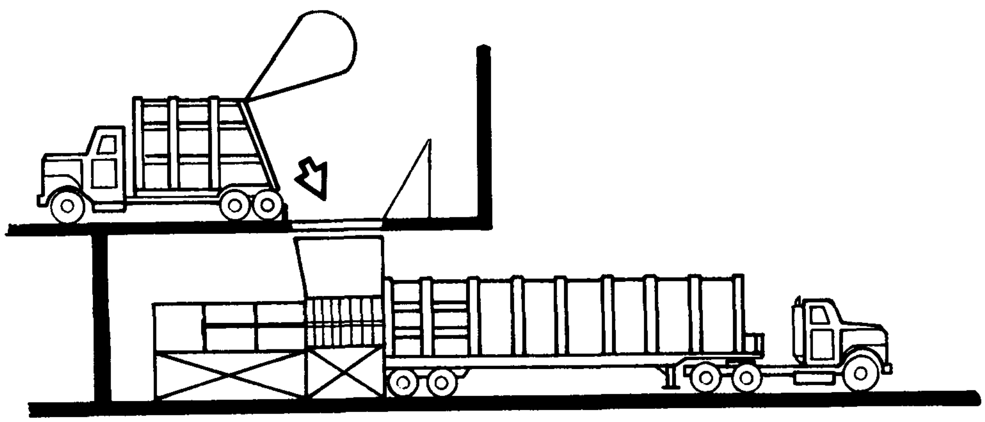
System E This system is well suited to small, clean-up operations where small trucks or automobiles would deliver

# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

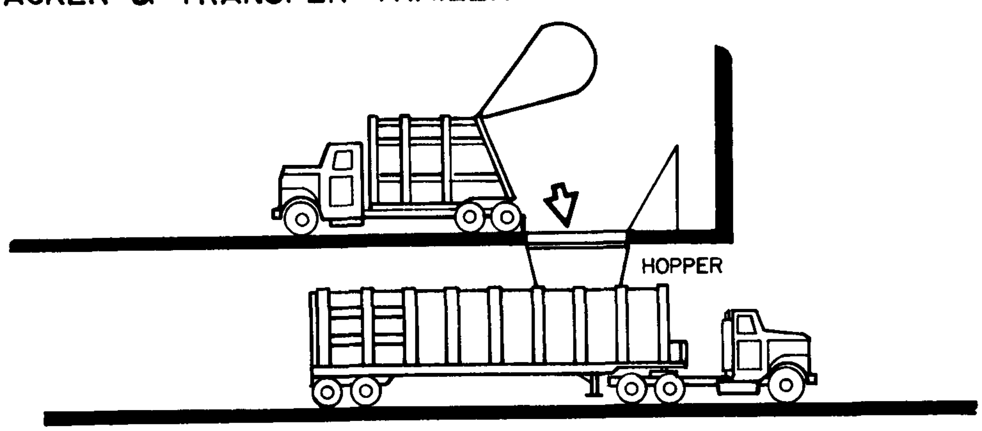
## SOLID WASTE TRANSFER STATION SYSTEMS




A. SINGLE LEVEL TRANSFER OPERATION USING CONVEYOR FEED TO A STATIONARY PACKER & TRANSFER TRAILER



B. TRANSFER OPERATION USING GRAVITY FEED TO A STATIONARY PACKER & TRANSFER TRAILER



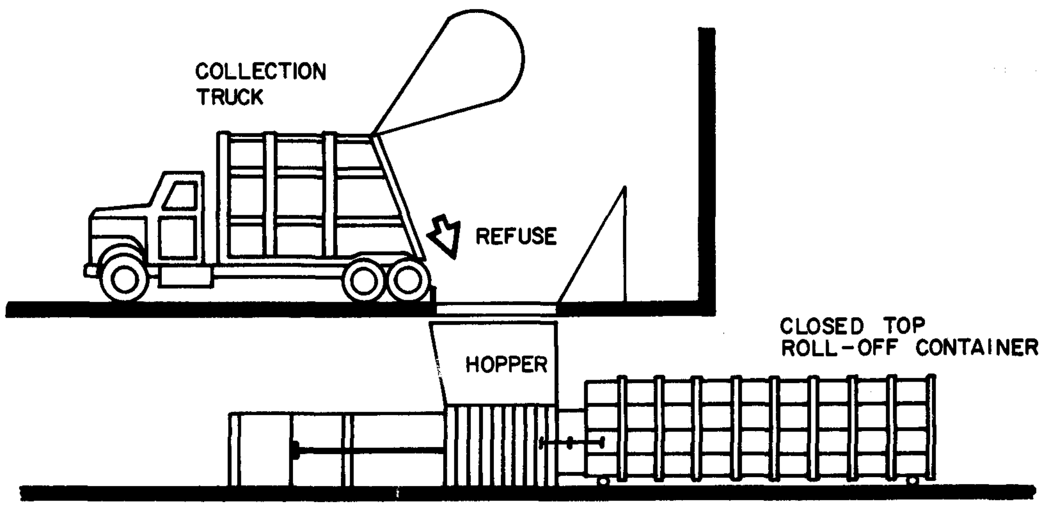

C. TRANSFER OPERATION USING GRAVITY FEED TO A TRANSFER TRAILER

FIGURE IX-2

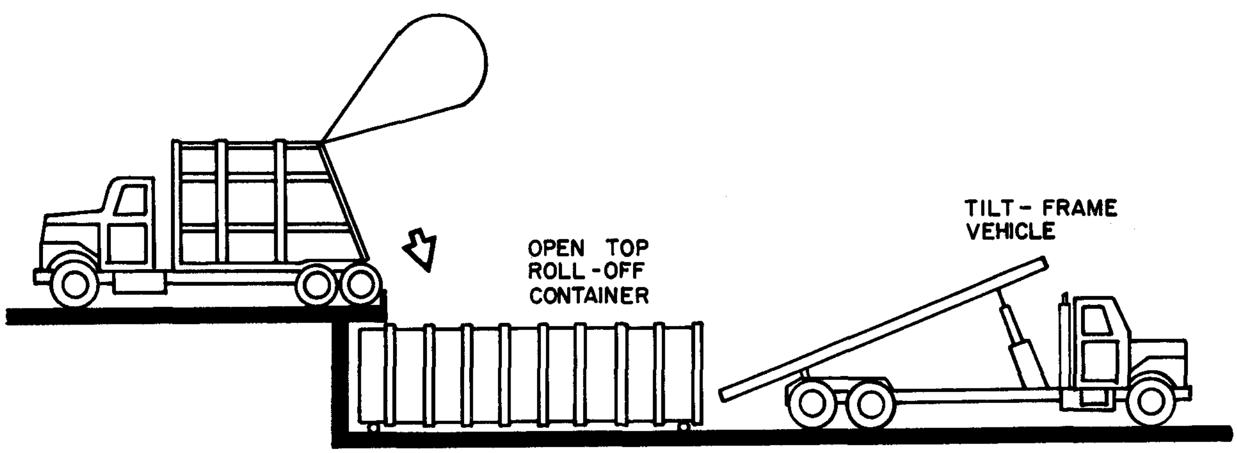
M. DISKO ASSOCIATES
CONSULTING ENGINEERS

# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

## SOLID WASTE TRANSFER STATION SYSTEMS




D. TRANSFER OPERATION USING GRAVITY FEED TO A STATIONARY PACKER AND ROLL-OFF CONTAINER




E. TRANSFER OPERATION USING GRAVITY FEED TO A ROLL-OFF CONTAINER

FIGURE IX-3

M. DISKO ASSOCIATES
CONSULTING ENGINEERS

NOTE: TEXT CONTAINS DETAILED DESCRIPTIONS small loads of uncompacted waste to a facility loading open-top roll-off containers. Occasionally, a backhoe might be employed to achieve a mild compaction of the wastes and to even the loads. The open-top roll-off container would be serviced by a tilt-frame truck.

## DESIGN AND LOCATION FACTORS

The overall design and location of a transfer station is based on factors such as the anticipated through-put solid waste volume, the location of the site, and the equipment used. Several factors which affect the site selection process include: 1) traffic accessibility; 2) zoning and existing land use; 3) proximity to collection routes; and 4) distance to the disposal site. Criteria affecting the selection and sizing of equipment include: 1) anticipated solid waste volumes; 2) transfer haul vehicles restrictions; 3) type of waste handled; 4) quantity and nature of incoming vehicles; 5) desired processing operations; and 6) peak load allowances (storage).

To maximize advantages, a transfer station should be located to minimize the haul between the collection points and the station. Since the station's operation is fully enclosed in an industrial type building, noise, dust and odor problems are minimized. This allows flexibility in siting the station which can easily be blended into a commercial or industrial setting.

Of major importance in locating a transfer station is access to fast moving arterial roads and highways. A transfer station is ineffective if the transfer trailers are tied up in traffic. Also, traffic flowing to the station should not pass through heavily populated residential areas. Ideally, a station should be located on or near a route with existing heavy truck traffic where additional packer collection trucks would not be noticed. In Ocean County, a location near the Garden State Parkway or Routes 9, 37, 70 or 72 would have minimal impact on existing patterns.

In Ocean County a transfer station would be housed in an attractive, industrial-type, sheet metal or brick building. These buildings enable the station to control dust, litter, odors, and birds so the facility will be an acceptable environmental neighbor. Often landscaping of transfer stations near residential areas can improve the appearence of the facility and reduce any visual impact.

ECONOMIC JUSTIFICATION OF A TRANSFER STATION OPERATION

A transfer station can offer potential savings if the costs involved in constructing and operating the station are recovered through savings in haulage costs. A transfer station will not lower the disposal costs. The transfer station concept minimizes the time necessary for haulage and maximizes the time spent on collection routes. Since the packer collection trucks only travel a short distance to unload at the station, they can return to their collection routes while a transfer trailer makes the longer haul to the disposal site.

Generally a transfer facility is justified if the round trip haul distance to the disposal site exceeds 20 miles. However, each area must be studied individually to determine the break-even distance beyond which a transfer station saves money. Factors such as wage rates, type of access roads, collection truck capacity, and size of collection crews (i.e., one man, two men, etc.) influence the breakeven distance.

Although distance to the disposal site is important, often the round-trip travel time to the site is also an important factor. One of the most expensive aspects of refuse collection, labor costs, are keyed to time, not distance. Additional factors such as routes taken, traffic conditions, speed limits, time of day, etc., also influence travel time.

To arrive at a relationship that can be used to determine the economic justification of a transfer operation, a comparison must be made of haul by packer truck and transfer haul.

It is possible to calculate a cost associated with a packer truck with a one, two, or three man crew and compare it to a capital and operating cost for a transfer trailer and one driver. A series of lines can be generated, as shown on

Figure IX-4 that represent the various haul combinations. By comparing the direct haul with the transfer and haul, the breakeven distance can be found beyond which a transfer operation is economical and saves money.

## TRANSFER STATION AND EQUIPMENT COSTS

There are many factors which will determine the capital and operating costs for a transfer station. Some of these include; 1) type of building construction; 2) type of transfer system and related equipment; 3) location of facility; 4) throughput tonnage, etc. The processing equipment requirements vary from station to station. A gravity dump system into open top trucks requires the least capital expenditure for equipment while a stationary packer fed by a conveyor or pushpit would have substantially higher equipment cost.

The estimated cost of a transfer station facility, based on M. Disko Associates' design experience is shown on the following listing:

### APPROXIMATE CAPITAL COST OF BUILDING SITE WORK EQUIPMENT AND VEHICLES FOR TRANSFER STATION IN THE NEW JERSEY AREA

| NOMINAL 8 HR. CAPACITY | ESTIMATED CAPITAL COST |
|---|---|
| 75 tons | $200,000 to $350,000 |
| 150 tons | $400,000 to $550,000 |
| 250 tons | $500,000 to $700,000 |

# OCEAN COUNTY SOLID WASTE DISPOSAL MANAGEMENT STUDY

## COMPARISON BETWEEN PACKER TRUCK & TRANSFER TRAILER HAULAGE COSTS

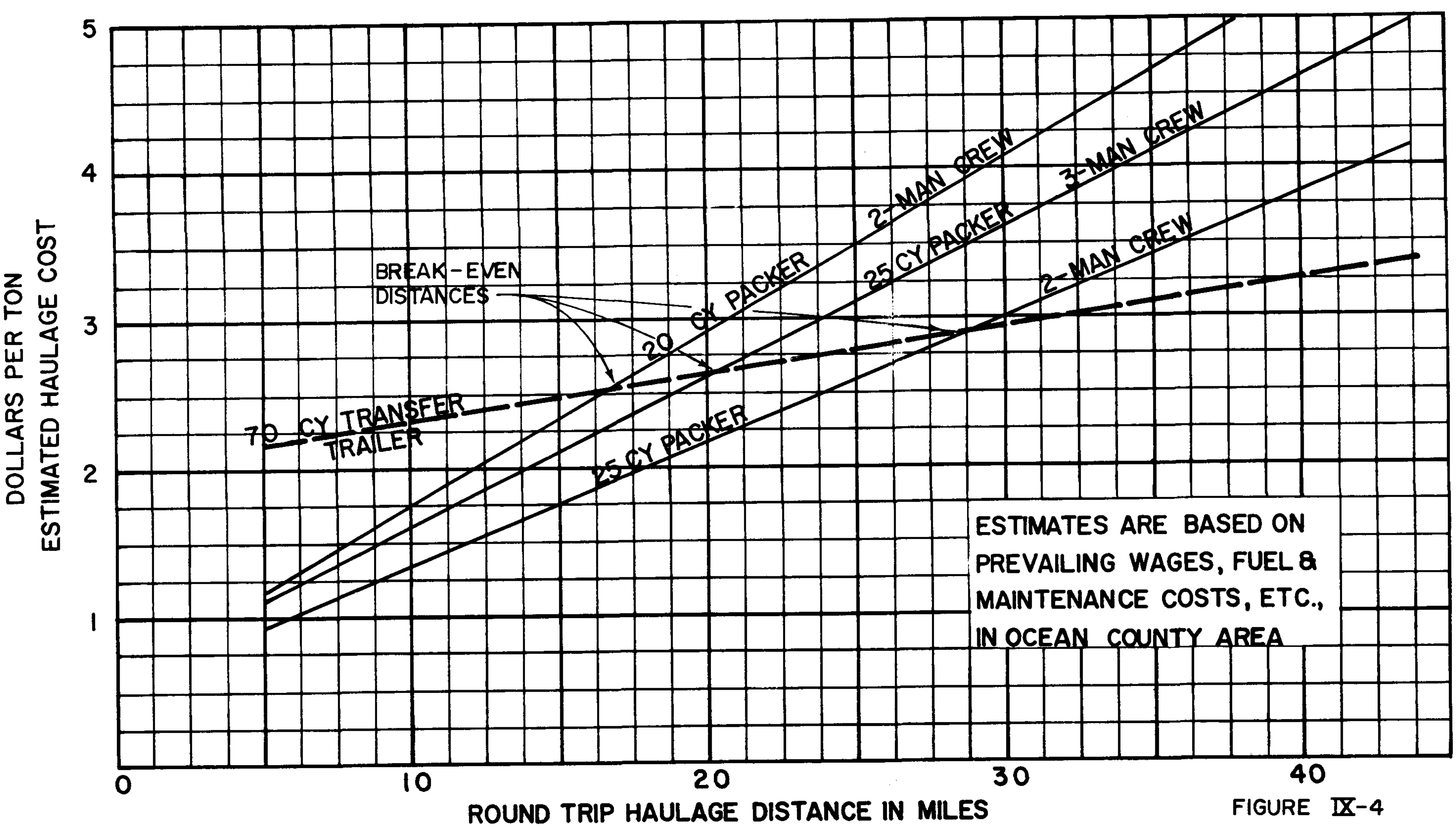



FIGURE IX-4

M. DISKO ASSOCIATES

Typically, overall cost of equipment, site improvements, and structures for a solid waste transfer station in Ocean County would range from about $2,000 to $5,000 per ton of 8 hour capacity, excluding land costs. Construction types can range from a simple facility without a structure to an enclosed facility with compaction equipment, offices, scale house, etc. The land required for a transfer station in the Ocean County area should be at least 2 acres, but usually about 5 acres are necessary to allow for a suitable buffer.

The overall cost of amortization, operation, labor and maintenance for a transfer station in Ocean County will be in the range of $1.50 to $3 per ton, depending on the round-trip haulage, but excluding any disposal charges.

Table IX-1 lists the approximate costs and delivery times for various equipment components of transfer station systems. Cost ranges and delivery times vary according to the manufacturer and the specific equipment specifications.

TABLE IX-1

APPROXIMATE COSTS AND DELIVERY TIMES FOR EQUIPMENT COMPONENTS

| ITEM AND DESCRIPTION | COST RANGE | REPORTED DELIVERY TIME DEPENDING ON MANUFACTURER |
|---|---|---|
| Hopper - steel plate, reinforced | $4,000 to $10,000 | 4 months |
| Stationary Packer, complete with hydraulic system for transfer trailer | $17,000 to $26,000 plus up to $5,000 to install | 6 months |
| Stationary Packer, complete with hydraulic system, for roll-off containers | $9,000 to $14,000 plus up to $4,000 to install | 4 to 6 months |
| Transfer Trailer 65 cubic yards | $19,000 to $27,000 depending on equipment | 3 to 6 months |
| Tractor Vehicle for transfer trailer, heavy-duty, tandem, diesel | $20,000 to $33,000 depending on equipment; add $6,000 for automatic transmission | 4 to 6 months |
| Push-Pit hydraulic components (does not include pit con-struction) | $9,000 to $12,000 | 6 months |
| Roll-off Container, 40 cy, open-top, steel plate | $2,000 to $5,000 | 2 to 6 months |
| Roll-off Container, 40 cy, closed-top, steel plate | $2,500 to $6,000 | 2 to 6 months |
| Tilt-Frame Vehicle heavy-duty truck 3-axle rig | $26,000 to $35,000, add $6,000 for automatic transmission | 3 to 6 months |
| Conveyor System, steel, reinforced, heavy-duty | $500/foot to $1,200/ft. depending on width and length | 5 to 12 months |

# X. SOLID WASTE DISPOSAL MANAGEMENT AND PLANNING CONSTRAINTS FOR OCEAN COUNTY

## PLANNING CONSTRAINTS FOR SOLID WASTE MANAGEMENT

In this section the factors affecting solid waste management in Ocean County including solid waste generation, existing collection and disposal systems, legal and administrative structures, markets for salvageable materials, existing solid waste processing and disposal methods, etc., will be reviewed from the point-of-view of how they affect the development of solid waste planning criteria in Ocean County. The importance of understanding the planning constraints which impact a county cannot be overstated, for it is only by working within these constraints that an effective solid waste disposal management plan can be implemented.

## PUBLIC ATTITUDES TOWARDS SOLID WASTE MANAGEMENT

Until very recently, the primary concern in solid waste management was to provide regular collection service. For example, insuring that solid waste was collected on schedule, that collection trucks and other equipment were in good working order, and that solid wastes were hauled to a relatively obscure existing landfill for disposal was the prime concern of the municipality. So long as service levels were maintained, the public was generally satisfied that their solid waste needs were being cared for adequately.

However, with the rapid residential, commercial, and industrial growth in Ocean County, the County has experienced demands for new schools, shopping centers, recreational facilities, sewage treatment, and transportation systems. As far as solid waste management was concerned, the rapidly increasing population and expansion of commercial and industrial production produced greater quantities of solid waste requiring disposal. As municipalities sought to expand their landfills, they were confronted by a shortage of suitable, close-in disposal sites and by a myriad of stringent new New Jersey Department of Environmental Protection regulations governing new or expanding landfills. Thus, many municipalities have found it increasingly difficult to provide economical, environmentally sound solid waste disposal.

As areas became more densely populated and developed, it became increasingly difficult, particularly in light of the negative view the general public had towards landfills and incinerators, to develop new solid waste disposal facilities. <u>Thus, in order to implement a comprehensive solid waste management plan, the plan must be capable of overcoming public opposition to any proposed solid waste processing and/or disposal facility</u>.

## INCREASED SOLID WASTE GENERATION

Another important solid waste planning factor is the fact that solid waste generation has been increasing and is expected to continue to increase in the future. This is the result of not only increased population, but an increase in per capita solid waste generation rates and anticipated increases in industrial, commercial and institutional solid waste production. The proposed solid waste management system must have the capability of handling increasing amounts of solid waste in the future.

EXISTING SOLID WASTE MANAGEMENT SYSTEMS IN OCEAN COUNTY

Unlike more densely populated counties which generally have to export their solid waste for disposal, Ocean County has been able to dispose of the vast majority of its solid waste within its own borders. As previously described in Chapter IV, there are twenty-two municipalities that collect and haul their own waste for disposal, eight municipalities that utilize contractors to collect and haul, and three municipalities where the residents contract directly with a private firm for solid waste collection. More importantly, there are fifteen municipalities within the County which contain landfills accepting municipal solid waste. These landfills, on the whole, are small operations that are uneconomically run and are creating an uncertain impact on the environment. A total, comprehensive county-wide solid waste plan must take into consideration these existing landfills. The system must provide for the gradual phase-out of these smaller landfills as municipalities phase into a county system. Additionally, as the Bureau of Solid Waste Management regulations concerning landfill operating procedures become more stringent, more and more of the small, marginally-operated landfills will be required to close.

## LEGAL AND ADMINISTRATIVE CRITERIA

Since county and municipal governments receive their governing powers from the New Jersey Constitution and Laws of New Jersey, it is imperative that this body of law be evaluated to determine what specific powers each level of local government has regarding solid waste management. These legal and administrative structures, identified in Chapter VI, establish specific parameters within which a county-wide solid waste management system can be implemented. Therefore, because of the available legal and administrative options, each option must be evaluated in terms of its ability to identify and implement practical solutions to solid waste management problems in Ocean County.

## MARKETS FOR RESOURCE RECOVERY

Since the emphasis in solid waste management is definitely toward resource recovery, it is appropriate to consider the marketability of recovered materials found in the solid waste stream. The importance of good, stable markets cannot be overstated, since revenues from the sale of recyclable materials and/or solid waste as a supplemental fuel may offset the additional costs of a resource recovery system and make the system more acceptable to cost conscious public officials and taxpayers. Thus, when evaluating the alternative processing and disposal systems, the potential marketability and revenues from the sale of recovered materials should be thoroughly assessed.

## SOLID WASTE DISPOSAL TECHNOLOGY

Solid waste technology is in a state of continuing development. Because of this, individuals making decisions concerning the selection of the appropriate technology must be certain that a disposal method has been sufficiently tested and developed to provide effective and efficient solid waste processing and disposal. Much of the technology, such as shredding, baling, magnetic separation, air classification, etc., used in solid waste management today has been developed, tested and adopted from other industrial uses. However, in developing a comprehensive solid waste management system, care must be exercised to ensure that all equipment is capable of meeting, with reasonable care and expense, those standards for which it was designed.

## COSTS OF A SOLID WASTE MANAGEMENT SYSTEM

Another important factor to consider when developing a solid waste management system is the comparative costs of existing and proposed systems. Cost evaluations should include capital construction as well as operational costs and, where appropriate, environmental costs. After a detailed analysis of system costs, the most cost effective system(s) should be chosen for a county-wide solid waste disposal plan.

## ENVIRONMENTAL CONSTRAINTS

With the passage of the Federal Solid Waste Management Act of 1965 came a new awareness of the potential negative impact a solid waste disposal facility might have on the environment.

Since this time, additional legislation, at both the Federal and State levels, has been passed which places stricter controls and regulations on solid waste management activities in order to reduce the possibilities of ground and surface water contamination, air pollution and other public health problems associated with improperly operated solid waste facilities. In New Jersey, for example, the Riparian and Wetland Acts will curtail the further utilization of flood plains and low-lying marshes for solid waste disposal facilities. Also, the New Jersey Department of Environmental Protection has recently issued a series of proposed solid waste management regulations which, if adopted, will require landfill operators to install ground water monitoring wells, stockpile cover material, and to adhere to specific operating procedures in order to ensure that disposal facilities meet all environmental standards.

Since Ocean County is dependent on groundwater aquifers for its water supply, the environmental impact of any proposed solid waste facility must be given careful consideration. <u>Thus, in developing a solid waste management plan for Ocean County, primary emphasis must be placed on protecting the County's valuable natural resources, including the groundwater aquifers, and ensuring that environmental quality standards are maintained</u>.

## APPENDIX A

## MUNICIPAL ORDINANCES CONCERNING SOLID WASTE MANAGEMENT

Twenty of Ocean County's municipalities have ordinances concerning solid waste storage, collection and disposal. Generally, local ordinances contain a statement of policy, definitions, the functions and powers of administrative agencies, standards and regulations, and enforcement aspects.

The purpose of the statement of policy is to guide the municipality's administrators in carrying out the purpose and function of the ordinance and to assist the court in interpreting the meaning of the ordinance. The definitions included broad definitions of technical terms such as solid wastes, refuse, garbage, recycling, resource recovery, processing, and disposal used in the ordinances. The administrative aspects identify the administrative agencies, usually the Department of Public Works or Health Department, which have major solid waste management responsibilities, and describe the functions and powers of these administrative agencies.

Standards and regulations should cover all the major elements pertaining to effective solid waste management of the specific ordinance. This might concern aspects of storage, collection, haulage, disposal, etc. The enforcement section provides penalties and procedures for ensuring that the rules and regulations contained in the ordinance are adequately carried out.

A summary of municipal solid waste management ordinances in Ocean County follows:

BOROUGH OF BEACH HAVEN

It shall be unlawful for any owner or tenant to accumulate brush, weeds, dead and dying trees, stumps, roots, obnoxious growth, filth, garbage, trash, debris, or any of said articles on any land in the Borough of Beach Haven in such a manner to constitute a public health or safety hazard. All of the above-mentioned health or safety hazards must be removed by the owner or tenant having control of the premises. The Building Inspector and the Health Officer shall make inspections from time to time to ascertain if any violations exist. If the owner or tenant in charge of the premises shall fail to correct the indicated violation, Borough employees shall remove same violation and charge the owner or tenant accordingly.

The garbage collection schedule is as follows:

North End - Engleside Avenue to 12th Street
Tuesday, Thursday and Saturday

South End - South of Engleside Avenue to
Nelson Avenue
Monday, Wednesday, and Friday

Trash collection every Thursday for all refuse other than garbage that is placed at the curb for pickup before 7:00 AM.

BOROUGH OF BEACHWOOD

Garbage shall be placed for collection at the curb on a designated garbage collection route. Garbage and rubbish collection shall be made on all garbage collection routes twice a week. All cans shall be of a cylindrical shape and shall have a top diameter equal to or larger than the bottom diameter. There shall be no obstructions in the interior and the cans must be waterproof metal or waterproof plastic. All cans must have a cover. The cans must not exceed thirty (30) gallon capacity. The weight must not exceed fifty (50) pounds. The maximum number of cans collected per collection day will be ten (10).

All paper, cardboard or other rubbish must be securely tied in bundles not exceeding 50 pounds in weight. All cans must be removed from the curb the same day as the collection.

All persons wishing to use the landfill area of the Borough of Beachwood must first secure a permit from the Borough Clerk. The permit will run from January 1 to December 31 of any given year. The landfill hours are 8:30 AM to 4:00 PM on weekdays, and 11:00 AM to 3:00 PM on Saturdays.

Any person or persons, firm or corporation violating the ordinance shall be subject to a fine of not less than $25 and not more than $500.

TOWNSHIP OF BRICK

Tree trimmings, hedge clippings and similar materials, including leaves, shall be placed in barrels, containers, or cans, or cut to a length not to exceed four (4) feet and securely tied in bundles not to exceed two (2) feet thick. During the months of October and November, and from April 15 to May 15, leaves may be placed at the curb. Garbage shall be placed in a watertight metal, plastic or vinyl container with handles and a tight-fitting lid. The containers must not weigh more than fifty (50) pounds and must be placed just inside the curb line. All garbage must be drained of water, wrapped in paper and placed in the container.

Newspapers, magazines and periodicals shall be securely tied in bundles, each having a maximum weight of 50 pounds. All garbage receptacles must be stacked so as to prevent a dog or small child from tipping the container over. No receptacles are allowed on the curb later than 8:00 AM on the morning following the day of collection. Collections shall start at 6:00 AM, and clean-up week will be the second week in June.

The municipality, through its collectors and sanitation department, shall collect no more than 10 cans from each commercial business, industrial plant or apartment complex at any one collection.

The dumping of garbage, rubbish, trash or ashes in any part of the municipality other than the Brick Township Landfill shall be unlawful.

No person may engage in the business of solid waste collection without first obtaining a permit from the Township of Brick. The applicant must state what garbage, refuse and wastes are intended to be collected, what days he intends to collect on, and a schedule of rates he intends to use. The applicant must specify what disposal site he expects to use. All collection vehicles shall be constructed and loaded in such a way as to prevent any contents from leaking or spilling. Any containers used for temporary storage of the wastes must be cleaned periodically and covers must be kept closed to prevent scattering of contents by the wind or access by rodents and vermin.

## TOWNSHIP OF DOVER

Tree trimmings, hedge clippings and similar materials shall be cut to lengths not to exceed 4 feet and not more than 2 feet thick and must be deposited just inside the curb line for collection. Garbage shall be placed in watertight metal containers with tight lids. The container shall be limited in size to not more than 50 pounds of contents. The cans must be placed within the curb line for collection. Leaves must be placed in a container from which they may be easily removed for disposal.

Newspapers, magazines, and periodicals shall be securely tied in bundles, each having a maximum weight of 50 pounds. Each garbage container shall be so stacked to prevent its accidental tipping by a child or a dog. Spillage of contents caused by overturning by other than a Township employee, must be cleaned up by the property owner or tenant. If the spillage is caused by a Township employee, the employee will promptly clean up the spillage.

Penalty for violation of this ordinance is punishable by a fine of not more than $25.00 or imprisonment.

## TOWNSHIP OF JACKSON

Any person, firm, corporation, etc., wishing to use the Jackson Sanitary Landfill must first procure a permit from the Township Clerk. Residents may dump at the landfill without a permit. The hours of the landfill and the fees charged will be posted at the gate to the disposal site. All persons, firms, corporations, etc., shall obtain a license to collect and haul garbage in the Township.

All collection vehicles shall be approved by the Jackson Chief of Police. The vehicles shall be totally-enclosed steel bodies, rear dumping, constructed, maintained and operated so that once garbage and/or refuse has been loaded, it cannot be reworked, sorted, handled, etc., unless the vehicle is dumping the load. All vehicles shall be equipped with a broom and shovel and all scattered litter shall be cleaned up at the loading point. All vehicles must be kept clean. A decal shall be issued by the Township and it must be displayed in a conspicuous place adjacent to the name and address of the licensee.

No garbage, refuse or rubbish, etc., may be dumped or disposed of on any grounds within the Township of Jackson other than in the designated disposal area.

BOROUGH OF LAKEHURST

Tree trimmings, hedge clippings and similar materials shall be cut to a length not to exceed four feet in length or two feet in thickness. Garbage shall be placed in watertight metal containers or plastic containers with tight lids. The receptacles cannot weigh more than 50 pounds when full. Leaves shall be placed in a container from which they may be readily loaded into a collection truck. Newspapers, magazines and periodicals shall be securely tied in bundles each having a maximum weight of fifty pounds. Garbage shall not be mixed in the same receptacle with any other materials mentioned in this ordinance.

Upset receptacles must be righted by the owner or tenant unless the receptacle is overturned by a Borough employee, in which case the Borough employee must clean up the spillage. All garbage containers shall be placed on the curb by the property owner on the day of collection or the night before, and must be removed from sight by the property owner the same day the waste is collected.

If the regulations as set forth in this ordinance are not followed, municipal garbage collectors will not be obliged to collect the refuse from the premises on which a violation exists.

The fine for conviction of violation of any of these ordinances shall be $25.00 or ten days in jail, or both.

BOROUGH OF LAVALLETTE

Garbage shall be placed in a tight metal, plastic, or vinyl container with handles and a tight lid, or in plastic disposal bags. The maximum weight of the contents of the containers is 50 pounds. All garbage must be drained of liquids and wrapped in paper or plastic before being deposited in garbage containers. All containers must be placed just inside the curb line.

Tree trimmings, hedge clippings and similar material shall be placed in barrels or other containers, cans or disposable plastic bags. Tree trimmings and similar material shall be cut to a length not to exceed four feet, nor weigh more than 50 pounds. Newspapers, magazines and periodicals shall be securely tied in bundles not weighing more than 50 pounds.

All receptacles must be removed from the curb no later than 3 hours after collection. No debris or bulky clean-up material may be placed at the curb other than on the days specified by the Mayor and Council as clean-up week.

TOWNSHIP OF LONG BEACH

Garbage and rubbish shall be deposited in covered, watertight receptacles, or plastic bags of approved types, and placed not further than 12 feet from the curb. The receptacles shall not be greater than 30-gallon capacity and they may not exceed 85 pounds in weight when filled. Hedge and tree trimmings and discarded hedges and shrubbery shall be placed in containers or tied in bundles not to exceed 3 feet in length and one foot in diameter.

Sufficient receptacles must be maintained for each building to store 4 days' worth of garbage. Business and commercial establishments will be collected on the same collection days as residential units. The firms will be limited to a total of 4 cans of refuse per pickup day. The owner or manager of any firm will be responsible for the removal and disposal of any wastes in excess of 4 cans per pickup day.

For the purposes of this ordinance, garbage is defined to mean offal of animals, fish, fowl, or vegetables, or refuse from kitchens and markets. Rubbish is defined to mean bottles, tin cans, paper, ashes, and debris. Violations of the ordinance are punishable by a fine not to exceed $50.00.

TOWNSHIP OF MANCHESTER

The Township of Manchester will not collect garbage, waste matter and/or ashes. Collection of garbage may be contracted for with a garbage disposal service authorized to conduct the operation of garbage disposal service within the Township. All garbage or trash which is collected must be delivered by the owner to the municipal dump.

Garbage and trash must be separated as follows. Garbage must be placed in metallic receptacles not exceeding 20 gallons in capacity, or 75 pounds in weight. The receptacles must have tight-fitting metallic covers and be watertight with two handles. Trash and rubbish receptacles should not be greater than 3 bushels. No garbage shall be swept or placed in the roadway. All garbage shall be drained of water, wrapped securely in paper, and placed in a metal container. Paper shall be secured and tied into bundles or other packages in a manner to prevent any scattering. The bundles must be of a size and weight to permit handling by one man. No garbage or trash is to be put out prior to the evening before the day of collection.

Grass, leaves, sidewalk sweepings and trash shall not be dumped in roadways. No rubbish or other waste material may be burned in roadways.

The owner of any truck or vehicle who is engaged in the business of picking up, carrying and transporting animal or waste matter from any place in the Township must obtain a permit for each vehicle from the Board of Health.

No person shall prevent or interfere with any employee or agent of the Township in the discharge of his duties in sweeping or cleaning any street or in the removal of garbage, trash, paper, etc.

TOWNSHIP OF OCEAN

It shall be unlawful to maintain or operate a sanitary landfill, or any place for the disposal of garbage or refuse, anywhere in the municipality without first having secured a license from the Township Clerk. Applications for landfills shall contain a description of the land site, which is not to be less than 100 acres, the sequence and plan of operation, source of water supply and nature of equipment to be used for its distribution, fire prevention and control plans, existing and proposed roadways, existing topography and water courses, profiles, including depth of final fill, estimated volumes, drainage plan, quantity of cover material, etc.

The operation of the landfill shall conform to the following criteria:

a) All garbage and refuse shall be thoroughly compacted by equipment of sufficient weight.

b) Refuse spread on the working area shall not exceed a depth of 10 feet.

c) There shall be adequate protection against fire and blowing paper and the refuse must be compacted at the end of the day's operation.

d) Cover material will consist of earth and/or other inert materials such as ashes, cinders, or gravel.

e) A minimum depth of 6 inches of material shall be kept on the inactive face of the landfill at all times. The working face of the landfill must be sloped downward and covered with 6 inches of cover at the end of the day.

f) No sewage or septic wastes may be deposited in the landfill.

g) Insect and rodent prevention and extermination programs will be carried out at the landfill.

h) Where the "trench method" of landfilling is used, successive parallel trenches must be at least two feet apart.

i) No sanitary landfill operation may be placed where seepage, drainage, or pumping of any material from the fill would constitute a public health hazard or nuisance.

The penalty for violation of this ordinance will be a fine of not more than $200. or imprisonment for 90 days.

BOROUGH OF OCEAN GATE

All garbage shall be placed in metal containers not to exceed a twenty-gallon capacity. The containers must have tight-fitting lids. Each container must be furnished by the property owner or tenant.

All paper or other light materials susceptible to being blown about shall be securely tied or otherwise fastened in a bundle so as to prevent contents from being blown about. All garbage containers shall be removed from the curb promptly after each garbage collection. The garbage must be placed in the vicinity of the street curb in such a manner so as not to interfere with traffic.

The penalty for violation of the ordinance is a fine of $25.00 or imprisonment for a period of not more than 10 days.

BOROUGH OF PINE BEACH

Every householder, tenant, lessee, or occupant of any and every building in the Borough of Pine Beach, shall provide garbage and ash containers with tight-fitting covers and handles. Garbage shall be drained of water and wrapped in paper and placed in rubbish receptacles and kept covered at all times. Cartons, boxes, crates, baskets and small branches must be tied into bundles and placed beside the receptacles. The Borough will not collect stone, plaster, brick, tile, gypsum or any refuse resulting from building or demolition operations.

All garbage and trash containers must be placed at the curb the day of collection and removed after collection. It is unlawful for any person to burn rubbish, refuse, or leaves without the issuance of a fire permit. No explosive materials shall be placed in any container of refuse or garbage to be removed by the Borough.

No person shall throw or deposit any litter in or upon any public street, sidewalk, beach, or on any other public place.

No person shall sweep into or deposit in any gutter, street, or other public place, any litter from any building or lot or from any public or private sidewalk or driveway. No person, while a driver or passenger in a vehicle, shall deposit or throw litter upon any street, public place, or upon private property. No person shall throw or deposit litter in any fountain, stream, storm sewer, catch basin, river or any other body of water within the Borough.

Furniture, furnishings and discarded household articles will be collected only during "cleanup week" established by proclamation by the Mayor of Pine Beach. Discarded refrigerators or other heavy items will not be collected by the Borough.

The fine for violation of the sections of this ordinance shall be $200. or a jail term not to exceed 90 days.

BOROUGH OF POINT PLEASANT

Trash and garbage shall be placed in watertight metal or plastic containers with lids. The receptacle shall not exceed 50 pounds in weight and each container must be placed just inside the curb line. No trash or garbage shall extend above the normal height of the container. Leaves shall be placed in a container from which they may be readily loaded into the disposal truck. All grass, weeds or similar growth shall be placed in a container so they may be readily emptied. The containers must not exceed fifty pounds in weight. Newspapers, magazines and periodicals shall be securely bound in bundles with a maximum weight of 50 pounds.

If containers are upset or overturned by anyone other than a Borough agent, the property owner or tenant must clean up the spilled refuse and place it in the container. Any Borough agent who upsets or spills refuse must clean up spillage and place it in the collection truck.

Tree trimmings, hedge clippings and similar materials shall be cut to a length not to exceed 4 feet and securely tied in bundles not to exceed 50 pounds in weight. Household furniture shall be placed so as not to fall into the right-of-way of the sidewalk or street. Refrigerators must have doors removed or placed so they cannot be opened.

Penalty for violation of the ordinance is punishable with a $25.00 fine or imprisonment for not more than 10 days.

BOROUGH OF POINT PLEASANT BEACH

All garbage and trash may be mixed and shall be drained of all water. Paper shall be securely tied into bundles or other packages in a manner to prevent any scattering while being handled. Ashes shall be stored in metal containers only.

No grass, leaves, brush, branches or yard rakings shall be placed loose or in piles on the sidewalk, gutter or street where they may be scattered by vehicles or wind.

All receptacles and containers shall be of such size and weight so as to be easily handled by one man and in no case shall they exceed 60 pounds in weight. All containers must be kept upright and tightly covered.

At no time, and at any one collection, shall more than four (4) garbage or trash cans be set out for collection from a private dwelling. No more than six (6) cans may be set out from any apartment, hotel, rooming house, store, business, building, etc., including industrial plants. All ashes, garbage, trash, rubbish, and refuse material must be removed and disposed of in areas outside of the Borough limits.

BOROUGH OF SEASIDE HEIGHTS

All garbage must be kept in plastic or metal containers. Boxes must not be used for storage of garbage.

Areas under the boardwalk shall not be used for the storage of trash. No trash or garbage is to be placed out for collection prior to 12 PM for collection the following day. Trash or garbage must not be set out for collection during daylight hours or when collections are not made. All receptacles must be placed between the curb and sidewalk; under no circumstances shall garbage be placed on the boardwalk. Garbage and trash in storage shall not be visible to the public at any time.

BOROUGH OF SOUTH TOMS RIVER

The owner, agent, lessee, tenant, or occupant of every dwelling house where waste accumulates shall provide and keep on such premises sufficient and suitable receptacles with tight-fitting covers for receiving and holding the waste. At least one receptacle for each family unit or other occupant of premises and at least two receptacles for each commercial or business establishment. The containers must be watertight metal, rubber or plastic with tight-fitting covers that prevent leakage and spillage. Each residential container must not exceed 20 gallons of capacity. Receptacles that are badly broken shall be collected by the person or agency responsible for the collection of refuse.

Garbage shall be thoroughly and completely drained of all liquids and wrapped in paper. Papers shall be secured and properly tied into bundles or other packages in a manner to prevent scattering while being collected. The bundles must be sized so as to be handled by one man. Combustible and non-combustible waste which cannot be deposited in a receptacle shall be securely and properly tied into bundles.

The person occupying any premises shall be required to arrange for pickup of refuse at least twice per week. Combustible waste may be burned on the premises provided the method of disposal is permitted by State law and a fire permit is obtained.

No person shall engage in the business of refuse collection, including garbage, in the Borough without first obtaining a license and permit. The license shall be effective for a period of one year.

All vehicles used for garbage collection shall be of the closed, compacting type and shall be constructed so no part of the contents can leak or spill out.

Violations of this regulation shall be punishable with a fine not exceeding $100.

TOWNSHIP OF STAFFORD

All dumping of any refuse in the Township shall be done within the landfill only, in accordance with the procedures hereby established. Any person, firm, or corporation dumping refuse or garbage in satisfaction of the municipal collection obligations of Stafford Township or the other municipalities under contract with Stafford Township to use the landfill may discharge said refuse without additional charge over and above the rate established in the contract. Any other person, corporation or firm dumping refuse in the landfill shall be charged established rates. All non-commercial users of the landfill that deposit loads delivered in cars or station wagons will not be charged. The hours of the landfill will be 8:00 AM to 10:00 PM, Monday through Saturday. No vehicle except private homeowners using private automobiles may enter the landfill to dump unless they show a valid collector-hauler decal obtained from the New Jersey Bureau of Solid Waste Management and a Stafford Township collector-hauler decal obtained from the Township Clerk.

Any person violating any of the provisions of this ordinance, and, upon conviction of said violations, must pay a fine not exceeding $50.00.

BOROUGH OF SURF CITY

No person shall sweep, throw or deposit litter in or upon any occupied, open or vacant property, within the Borough of Surf City, except in public receptacles, authorized private receptacles or official Borough dumps.

No person shall bring, cart, remove, transport, or collect any litter from outside this Borough or into the Borough for the purpose of dumping or disposing thereof, unless so authorized by the Borough.

Any person convicted of a violation of this ordinance shall pay a fine not exceeding $500. or be sentenced to a jail term not exceeding 90 days.

TOWNSHIP OF UNION

No person, firm, or corporation shall throw, place or deposit or permit anyone under their control to throw, place or deposit any garbage, rubbish, or other material upon any vacant lot or parcel of ground within the Township of Union without first obtaining the permission of the Township. People using the disposal site must conform to all rules and regulations that are in effect at the landfill.

The Township of Union may permit any person, firm, or corporation to operate a landfill in the Township provided they apply to the Township for a permit to operate the landfill. The permit must state where the disposal site is to be located. The annual license fee for the permit will be $250.