NORTH BROWARD COUNTY RESOURCE RECOVERY PROJECT, INC. SOLID WASTE ENERGY RECOVERY FACILITY

APPLICATION FOR POWER PLANT SITE CERTIFICATION - HILTON ROAD SITE

Submitted By

The Broward County Board of County Commissioners

BROWARD COUNTY • FLORIDA

February 1986

Resource Recovery Office
Room 521, 115 South Andrews Avenue
Fort Lauderdale, Florida 33301
(305) 357-6458

February 24, 1986

State of Florida
Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

Attention: Mr. Hamilton Oven, P.E.
Power Plant Siting Section

Re: Power Plant Site Certification Application
North Broward County Resource Recovery Project, Inc.

Gentlemen:

On behalf of the Broward County Board of County Commissioners and North Broward County Resource Recovery Project,Inc., this application for certification under Chapter 17-7, FAC for construction and operation of the referenced project is herewith submitted for Departmental review. Also herewith transmitted, in conjunction with the application itself, is the requisite $25,000 fee per FAC Rule 17-7. This application has been prepared in accordance with the intent of the Power Plant Siting Act as set forth in Chapter 403, Florida Statutes, the requirements of the Electrical Power Plant Siting Regulations as set forth in Rule 17-7 FAC and the format and informational requirements of Electrical Power Plant Site Certification Applications as set forth in Florida Department of Environmental Regulation Form 17-1.211(72).

Please note that the co-applicant for this certification, North Broward County Resource Recovery Project, Inc., as owner and operator of the referenced project, constitutes a legal corporation incorporated in the State of Florida for the purpose of providing solid waste disposal and resource recovery services. The parent of this corporation during the construction and operation of the proposed facility will be a partnership established by Waste Management, Inc. and Morrison-Knudson Company, Inc., the vendor selected by the County to develop this project.

Broward County has, since 1981, been engaged in planning and engineering studies designed to implement a sound program of solid waste management. The resource recovery program identified through these efforts, of which the referenced project is an integral part, will provide Broward County a proven and reliable means of solid waste disposal which is necessary to resolve the capacity limitations of its existing landfills. Expeditious implementation of the identified program is critical to the continued ability of Broward County to dispose of such waste in an environmentally and economically acceptable manner and thereby help preserve the public health and environment and maintain the standard-of-living and well-being of the County citizenry.

Several significant accomplishments have marked efforts to implement the proposed resource recovery program and realize the above stated objective. Firstly, Broward County has secured financing for the program through the issuance of Industrial Development Bonds which, with a total bond issue in excess of 521 million dollars, represents the largest bond issue undertaken to date in the United States for a single resource recovery program. These funds must, however, be committed to construction by February 26, 1987.

Secondly, the County selected two full-service vendors in July 1985 to enter into construction and service agreements with the County. An affiliate of Waste Management, Inc. and Morrison-Knudson Company, Inc. will be the vendor for the North Broward County Project.

Thirdly, significant progress has been made in obtaining permits for the Southern Resource Recovery Project including proceeding under Chapter 17-17, FAC.

Fourthly, the Florida Public Service Commission on January 7, 1986, approved the Northern Broward County Resource Recovery Project petition required by Chapter 403,FS, for all applicants under the Power Plant Siting Act.

Finally, the County has made significant progress toward reaching an interlocal agreement for waste flow control with the 28 municipalities in the County.

As discussed above, it is imperative that the proposed resource recovery program be implemented at the earliest possible time in order for Broward County to provide solid waste disposal services for its citizenry in the near future. Failure to do so will jeopardize not only the future social vitality of Broward County, but may, in the absence of available disposal alternatives, compromise the existing quality of environmental resources in the area by continuing sole reliance on landfill practices for disposal of the County's solid waste stream. Therefore, Broward County is prepared to commit, consistent with applicable regulatory requirements and provisions, those resources necessary for expeditious implementation of the referenced project. Our current schedule, which is based on having the referenced project facilities on-line and available to serve Broward County needs by early 1989 dictates that construction commence on the proposed site by the end of 1986.

We sincerely believe that the issues to be determined in review of this application for certification are very limited in contrast to the recent applications covering the Southern Broward County and Palm Beach County Projects. Further, the major issues associated with this Project, air emissions and storm water management, are already well known to both the applicant and reviewing agencies. We would, therefore, hope that the review of this application and issuance of certification can be expedited to a significant degree.

We would hope the required hearings on the application can be held in late this Spring or early Summer. This will require coordination of all of the agencies involved, but should be possible because of the limited number of issues, familiarity of agencies with the proposed project and issues and the urgent need to complete the certification process by mid-October. This deadline is a significant one since maintaining financing of the project is dependent upon completing all required permitting activities by that time. Failure to secure financing and beginning construction this Fall would at best cost many additional millions of dollars and at worst could make the project unfinancable due to restrictions already imposed by Congress which limits bonding capacity of state and local government.

You continued cooperation and assistance will be sincerely appreciated.

Very truly yours,

Thomas M. Henderson

Thomas M. Henderson
Project Director
Broward County Resource Recovery Office
and
Attorney-in-Fact
North Broward County Resource Recovery Project, Inc.

NORTH BROWARD COUNTY RESOURCE RECOVERY PROJECT, INC.
SOLID WASTE ENERGY RECOVERY FACILITY

POWER PLANT SITE CERTIFICATION APPLICATION
HILTON ROAD SITE

SUBMITTED BY

BROWARD COUNTY BOARD OF COUNTY COMMISSIONERS
Broward County Governmental Center
115 S. Andrews Avenue
Fort Lauderdale, Florida 33313

FEBRUARY 1986

MALCOLM PIRNIE, INC.
2 Corporate Park Drive
P.O. Box 751
White Plains, New York 10602

MALCOLM PIRNIE

BEST AVAILABLE COPY

SUN BANK/SOUTH FLORIDA N.A.
P.O. BOX 5100
FORT LAUDERDALE, FLORIDA 33310

BOARD OF COUNTY COMMISSIONERS

BROWARD COUNTY

FORT LAUDERDALE, FLORIDA

63-607/670

NO. 0093019

PAY $25,000 00

DATE	CHECK NO.	AMOUNT
02/20/86	93019	****25,000.00

BROWARD COUNTY FLORIDA

WCDS REVENUE/CENTRAL OPERATING ACCOUNT

TO THE ORDER OF

FLORIDA DEPT. OF ENVIRONMENTAL REGULATION
2600 BLAIR STONE RD TWIN TOWERS BLDG.
TALLAHASSEE, FLORIDA 32301

VOID AFTER (90) NINETY DAYS

CHAIRMAN BOARD OF COUNTY COMMISSIONERS

AUTHORIZED SIGNATURE

⑈093019⑈ ⑆067006076⑆ 41700244494⑈

NORTH BROWARD COUNTY RESOURCE RECOVERY PROJECT, INC.
SOLID WASTE ENERGY RECOVERY FACILITY
APPLICATION FOR POWER PLANT SITE CERTIFICATION
BROWARD COUNTY, FLORIDA

APPLICANT INFORMATION

Applicant's Official Name:	Broward County Board of County Commissioners and North Broward County Resource Recovery Project, Inc.
Address:	c/o CT Corporation System 8751 West Broward Boulevard Plantation, Florida 33324
Business Entity:	A Florida Corporation
Name and Title of Business Head:	Andrea K. Feirstein Member, Board of Directors
Name, Title and Address of Representative Responsible for Obtaining Certification	Thomas M. Henderson Attorney-in-Fact Room 521 115 South Andrews Avenue Ft. Lauderdale, Florida 33301
Site Location:	County: Broward Address: 2700 Hilton Road (N.W. 48th St.) Pompano Beach, Florida 33060 (Unincorporated Area) Latitude: 26° 17' 13" N Longitude: 87° 09' 35" W UTM Zone: 17 UTM x coordinate: 583.8 km UTM y coordinate: 2907.6 km Township and Range: T48S, R42E, Section 16
Location of Any Directly Associated Transmission Facilities:	Florida Power and Light Company Substation

MALCOLM PIRNIE

NORTH BROWARD COUNTY RESOURCE RECOVERY PROJECT, INC.
SOLID WASTE ENERGY RECOVERY FACILITY
APPLICATION FOR POWER PLANT SITE CERTIFICATION
BROWARD COUNTY, FLORIDA

APPLICANT INFORMATION (continued)

Nameplate Generating Capacity of Proposed Facility:	55.5 megawatts
Ultimate Generating Capacity for Certification	83.25 megawatts
Purpose of Project:	The purpose of the proposed solid waste-fired electrical power plant is to dispose of solid waste and recover energy and possibly materials. This proposed facility will afford Broward County a method of solid waste disposal as a substitute for the present sanitary landfilling operations and in doing so generate enough electricity to service over 40,000 homes annually.

BROWARD COUNTY
RESOURCE RECOVERY PROJECT

o Consulting Engineering Team

Malcolm Pirnie, Inc.
2 Corporate Park Drive
White Plains, NY 10602

Hazen & Sawyer, P.C.
5950 Washington Street
Hollywood, FL 33023

William F. Cosulich Associates, P.C.
1 Crossways Park West
Woodbury, NY 11797

Keith & Schnars, P.A.
1115 N.E. 4th Ave.
Ft. Lauderdale, FL 33304

Environmental Science and Engineering, Inc.
P.O. Box ESE
Gainesville, FL 32602

Cal Recovery Systems, Inc.
160 Broadway
Suite 200
Richmond, CA 94804

KBN Engineering and Applied Sciences, Inc.
P.O. Box 14280
Gainesville, FL 32604

o Special Counsel

Greenberg, Traurig, Askew, Hoffman,
Rosen & Quentel, P.A.
1401 Brickell Avenue
Miami, FL 33131

o Bond Counsel

Brown, Wood, Ivey, Mitchell and Petty
One World Trade Center
New York, NY 10048

BROWARD COUNTY
RESOURCE RECOVERY PROJECT

- Financing Advisor

  Lazard Freres and Company
  1 Rockefeller Plaza
  New York, NY 10020

- Senior Co-Managing Underwriters

  Kidder Peabody and Company
  10 Hanover Square
  Public Finance Department
  New York, NY 10005

  Smith Barney, Harris Upham and Company
  1345 Avenue of the Americas
  New York, NY 10105

NORTH BROWARD COUNTY RESOURCE RECOVERY PROJECT, INC.
SOLID WASTE ENERGY RECOVERY FACILITY
APPLICATION FOR POWER PLANT SITE CERTIFICATION

TABLE OF CONTENTS

MALCOLM PIRNIE

TABLE OF CONTENTS (continued)

MALCOLM PIRNIE

TABLE OF CONTENTS (continued)

MALCOLM PIRNIE

TABLE OF CONTENTS (continued)

MALCOLM PIRNIE

TABLE OF CONTENTS (continued)

MALCOLM PIRNIE

TABLE OF CONTENTS (continued)

MALCOLM PIRNIE

LIST OF TABLES

MALCOLM PIRNIE

LIST OF TABLES (continued)

LIST OF TABLES (continued)

MALCOLM PIRNIE

LIST OF TABLES (continued)

MALCOLM PIRNIE

LIST OF TABLES (continued)

LIST OF PLATES

LIST OF FIGURES

LIST OF FIGURES (continued)

MALCOLM PIRNIE

LIST OF FIGURES (continued)

MALCOLM PIRNIE

LIST OF FIGURES (continued)

ABBREVIATIONS AND ACRONYMS

AADT	-	Average annual daily traffic
AAQS	-	Ambient air quality standard
ADT	-	Average daily traffic
AMSL	-	Above mean sea level
AGL	-	Above grade level
AQCR	-	Air Quality Control Region
AQS	-	Air quality standards
ASHRAE	-	American Society of Heating, Refrigerating and Air Conditioning Engineers
BACT	-	Best available control technology
BCEQCB	-	Broward County Environmental Quality Control Board
BCLUP	-	Broward County Land Use Plan
BCNRWTP	-	Broward County North Regional Wastewater Treatment Plant
BCUD	-	Broward County Utilities Division
CDSL	-	Central Disposal Sanitary Landfill
CEC	-	Cation exchange capacity
CM/SEC	-	Centimeters per second
CO	-	Carbon Monoxide
COD	-	Chemical Oxygen Demand
CY	-	Cubic yards
DAHRM	-	Division of Archives History and Records Management (Florida Department of State)
dBA	-	Decibel (A-weighted scale)
DER	-	Florida Department of Environmental Regulation
DRC	-	Broward County Development Review Committee
DO	-	Dissolved Oxygen
DRI	-	Development of Regional Impact
ESP	-	Electrostatic precipitator
FAA	-	Federal Aviation Administration
FAAQS	-	Florida Ambient Air Quality Standards
FAC	-	Florida Administrative Code
FDER	-	Florida Department of Environmental Regulation
FEMA	-	Florida Emergency Management Agency
FGD	-	Flue Gas Desulfurization
FLUCCS	-	Florida Land Use and Cover Classification System
FML	-	Flexible membrane liners
FP&L	-	Florida Power and Light Company

ABBREVIATIONS AND ACRONYMS (continued)

GEP	-	Good Engineering Practice
gpd	-	Gallons per day
gpm	-	Gallons per minute
gr/dscf	-	Grains per dry standard cubic foot
HDPE	-	High Density Polyethylene
HSH	-	Highest Second Highest Concentration
Hz	-	Hertz
ILA	-	Interlocal Agreement for Solid Waste Disposal Service
ISCST	-	Industrial Source Complex Short-Term Model
kips	-	Kilopounds (1000 pounds)
km	-	Kilometers
kv	-	Kilovolt
kw	-	Kilowatt
LAER	-	Lowest Available Emission Rate
M^3	-	Cubic meter
MCL	-	Maximum Contaminant Level
mgd	-	Million gallons per day
mg/l	-	milligrams per liter
mps	-	Meters per second
MSL	-	Mean Sea Level
mw	-	Megawatts
NAAQS	-	National Ambient Air Quality Standards
NGVD	-	National Geodetic Vertical Datum
NHPA	-	National Historic Preservation Act
NOAA	-	National Oceanographic and Atmospheric Administration
NPDES	-	National Pollutant Discharge Elimination System
NSSFC	-	National Severe Storms Forecast Center
NSPS	-	New Source Performance Standards
NWS	-	National Weather Service
NO_2	-	Nitrogen Dioxide
ppm	-	Parts per million
PSC	-	Public Service Commission
PSD	-	Prevention of Significant Deterioration
psi	-	Pounds per square inch
psf	-	Pounds per square foot
P.U.D.	-	Planned Unit Development
PURPA	-	Public Utility Regulatory Policies Act
PVC	-	Polyvinyl Chloride

ABBREVIATIONS AND ACRONYMS (continued)

RCRA - Resource Conservation & Recovery Act
RFP - Requests for Proposals

SCA - Specific Collection Areas
SCS - Soil Conservation Service
SELS - Severe Local Storms
SES - Signal Environmental Systems
SHPO - State Historic Preservation Officer
SIA - Significant Impact Area
SIL - Significant Impact Level
SIP - State Implementation Plan
SO_2 - Sulfur Dioxide
SR - State Road
SW - Solid Waste
SFWMD - South Florida Water Management District

tpd - tons per day
tpy - tons per yard
TSP - Total Suspended Particulates

USCOE - U.S. Army Corps of Engineers
USEPA - United States Environmental Protection Agency
USFWS - United States Fish and Wildlife Service
USGS - United States Geological Survey

vpd - vehicles per day
vph - vehicles per hour

WMI - Waste Management, Inc.

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Introduction

Broward County can no longer rely on conventional landfilling as its only method of solid waste disposal for practical, environmental, economic and social reasons. As in many other urban Florida counties, the expansion of existing, or siting and development of new, landfills has become increasingly difficult. The decreasing availability of land, stricter regulation of both the development and operation of landfills and neighborhood opposition have all contributed to this situation. At the same time, State policies have encouraged local governments to look more and more to the recovery of the material and energy resources found in solid waste.

Broward County's decision to build a solid waste energy recovery facility is the result of nearly seven years of research, analysis and planning. Since 1978, the Broward County Board of County Commissioners has been working to find a viable long-term alternative to sanitary landfilling. The County started this effort soon after the State of Florida enacted Section 403.706, Florida Statutes, requiring urbanized counties like Broward to submit resource recovery and solid waste management plans. Numerous studies, commissioned by the County since 1978, have demonstrated the need for resource recovery as a long-term solution to the County's solid waste disposal needs. The filing of this application for the North Broward County Resource Recovery Project, Inc. represents the County's continuous efforts to reach its solid waste disposal objectives.

Purpose of Proposed Facility

The purpose of the facility is to dispose of solid waste generated predominantly within Northern Broward County. Noncombustibles and inert ash residue resulting from the plant's combustion process will be landfilled at a landfill owned by Waste Management, Inc. of Florida and located adjacent to the Project site. The permits required for construction and operation of this landfill have already been issued.

The electrical power derived from the combustion of the refuse is an additional benefit of the Project. Electrical energy sales to Florida Power and Light Company (FP&L) will help offset the overall cost of the Project. The County will contract with a full-service vendor controlled by Waste Management, Inc. to design, construct, and operate the Project for 20 years with four, five year renewal option periods totaling twenty years.

The Project is designed to meet the State's goal of enhancing environmental quality and preserving natural resources. Broward County is committed to protecting its groundwater and surface water resources by among other things, reducing its reliance on sanitary landfilling of solid wastes. The only viable means for Broward County in achieving these goals is through a solid waste-fired electrical power plant.

Site Location

Pursuant to Section 403.506, Florida Statutes, Broward County is applying for certification for a solid waste-fired electrical power plant on a 25 acre tract in unincorporated Broward County at Powerline and Hilton Roads in Section 16, Township 48 and Range 42. The Project site is well located to serve Northern Broward County. Access is available for on site interconnection to Florida Power and Light Company transmission lines.

Section 403.506 Florida Statutes states that any power plant or steam generating plant with a rated capacity of 50 megawatts or larger must be certified as a power plant site. The North Broward Resource Recovery Facility is proposed to have an initial capacity of 55.5 megawtts and, therefore, falls under the site certification process.

Facility Description

The Project will be a mass-burn resource recovery facility with an initial continuous design rated capacity of 2,200 tons per day of solid waste and a gross electrical generating capacity of approximately 55.5 megawatts. In anticipation of future disposal needs, Broward County is seeking certification for an initial site electrical generating capacity of approximately 55.5 megawatts with consideration of an ultimate generating capacity of approximately 83.25 megawatts (gross), using 3300 tons per day of solid waste.

Application Overview

This application has been prepared in accordance with the State of Florida Department of Environmental Regulation (DER) Chapter 17-17 Rules and follows the format prescribed in DER Form 17-1.211(1), FAC (Instruction Guide for Certification Applications: Electrical Power Plant Site, Associated Facilities, and Associated Transmission Lines).

This application consists of two (2) volumes:

Volume I (Application) - contains the Applicant Information Sheet, Sections 1-9 as presented in the DER Instruction Guide, and a listing of references.

Volume II (Appendices) - contains Section 10, Appendices 10.1 through 10.17 of the application.

As required by Rule 17-17.121 (3) (a), FAC three (3) separately bound copies of materials which show the procedures being taken to accomplish compliance of the site with existing land use plans and zoning ordinances are included as well. This compilation of information is referred to as the "Compliance Document" and is entitled "Compilation of Information - Hilton Road Zoning and Land Use."

Principal Findings

The Project will be designed and operated to meet all applicable Federal, State, Regional and County standards. As planned, the Project will have minimal impact on the surrounding environment. The analysis presented in this application supports these findings and is summarized as follows:

- Determination of Need - On January 7, 1986 the Florida Public Service Commission (PSC) approved a resolution ordering issuance of a preliminary order of approval of Broward County's petition which determined a need for a solid waste fired electrical generating facility exists in northern Broward County pursuant to 404.519, F.S. and Section 25-22.80, FAC.

- Air Quality - As discussed in Sections 3.4, Air Quality, the combustion process for the facility will be environmentally sound. The results of the Prevention of Significant Deterioration (PSD) analysis indicate:

  - Best Available Control Technology/Lowest Achievable Emission Rate (BACT/LAER) for the proposed source is the use of emission controls inherent to the system design with Electrostatic Precipitators (ESP) designed to meet an outlet grain loading well within Federal and State regulations;

  - The facility will operate in compliance with the Prevention of Significant Deterioration (PSD) increments, National Ambient Air Quality Standards (NAAQS), and Florida Ambient Air Quality Standards (FAAQS) for all criteria pollutants;

  - Fugitive dust created during construction of the facility is addressed in Section 4.5. With suggested standard mitigative measures, there will be no adverse effects due to fugitive emissions;

  - Total suspended particulates (TSP) are examined in Section 5.6.1 and Appendix 10.1.5. The proposed resource recovery facility emissions will result in an ambient impact well within Florida Ambient Air Quality Standards for TSP;

  - As discussed in Section 3, the tipping area and refuse bunker will be enclosed and under negative air pressure. Thus, odors will be contained within the resource recovery building. Odors within the building will be drawn into the furnace and destroyed through the combustion process; and

- The emissions from the facility will not have any adverse effect on surrounding soils, vegetation or visibility.

o Land Use and Zoning - The Project site is designated industrial in the Broward County Land Use Plan (BCLUP) and the Unincorporated Area Land Use Element (UALUE). Resource recovery is a utility (for solid waste disposal) and, as such, is an allowable use under the industrial designation.

  Resource recovery is consistent with and meets the goals and objectives of the Land Use Plans, the Traffic Circulation and Mass Transit, Drainage, Aviation, Utility, Economic Development, Solid Waste and Intergovernmental Coordination Elements of the Broward County Comprehensive Plan.

  The rezoning request for Planned Unit Development for Planned Special Complexes is in conformance with the permitted nonresidential uses listed under "Planned Special Complexes" (Section 39-883(b)(3)) of the Broward County Zoning Code.

o Noise - As discussed in Section 5.7, during operation of the resource recovery facility noise levels at the closest residence would not increase by a level perceptible to the human ear.

o Traffic - As discussed in Section 5.9, the solid waste energy recovery facility will not increase daily traffic on Powerline and Hilton Roads. The analysis shows that there will be no capacity problems on these existing streets.

o Surface Water and Groundwater - As discussed in Section 4.2 and 4.3, all plant process water will be drawn from county supply facilities and all wastewater will go to the North Regional Wastewater Treatment Plant. Potable water will be used in small quantities in the personnel areas of the plant and for boiler make-up. Cooling water will be secondary effluent supplied from the North Regional Wastewater Treatment Plant. All plant water will be recycled whenever possible. Runoff from vegetated areas, paved areas, and rooftops will be collected in onsite stormwater retention/detention basins. Refuse storage and ash/residue handling unit operations within the proposed facility will be covered and therefore, will not come into physical contact with precipitation or associated runoff. There will be no influence on groundwater quality as a result of the planned construction or facility operation.

- o Soil and Foundation Conditions - As discussed in Section 2.3.1, preliminary subsurface data indicate that certain surface conditions at the Project will require specific site preparation and subsurface foundation design. These subsurface conditions are considered typical of those normally encountered in the immediate area and will be addressed by appropriate site preparation and foundation design.

- o Plant and Animal Communities - No special plants, terrestrial/palustrine natural communities or aquatic natural communities are known or expected to occur within five miles of the Project site.

- o Archaeological Sites and Historic Preservation Areas - As discussed in Section 5.10, there are no historic or prehistoric resources known to be present within the Project site boundaries as confirmed by field investigations. Projected use of the Project site will therefore not impact any historic or prehistoric cultural resources.

Project Status

The Broward County Board of County Commissioners selected, after an extensive evaluation process, Waste Management, Inc. (WMI) as the vendor for the North Broward County Resource Recovery Project on July 2, 1985. WMI will be required to guarantee compliance with all terms and conditions of the Site Certification and County Development Order conditions through a binding contract with the County. Negotiations on the construction and service agreements are underway and are expected to be concluded by the first quarter of 1986.

Construction is scheduled to begin in December, 1986. The projected in-service date for the facility is April 1, 1989. The projected capital cost for the initial project development is approximately $167 million. The County has issued $521 million in adjustable rate industrial revenue bonds to cover the cost of developing the Project and other associated solid waste disposal projects.

The County, Waste Management and FP&L are presently discussing the details and means of providing an interconnection with FP&L's system and the rates to be paid for electrical energy sales. Based on FP&L's preliminary investigation of electrical interconnection requirements, there does not appear to be a need for new transmission line corridors or any other long narrow siting corridors (e.g., rail lines, or influent or effluent pipelines) that would leave the area near the proposed facility or adjacent landfill (see Section 6 - Transmission Lines and Other Linear Facilities).

The County has also made significant progress toward achieving an Interlocal Agreement for solid waste disposal services with the 28 municipalities in the County. This Agreement is expected to be finalized in early 1986.

NORTH BROWARD COUNTY RESOURCE RECOVERY PROJECT, INC.
SOLID WASTE ENERGY RECOVERY FACILITY
APPLICATION FOR POWER PLANT SITE CERTIFICATION

SECTION 1

NEED FOR POWER AND THE PROPOSED FACILITY

1.1 Overview

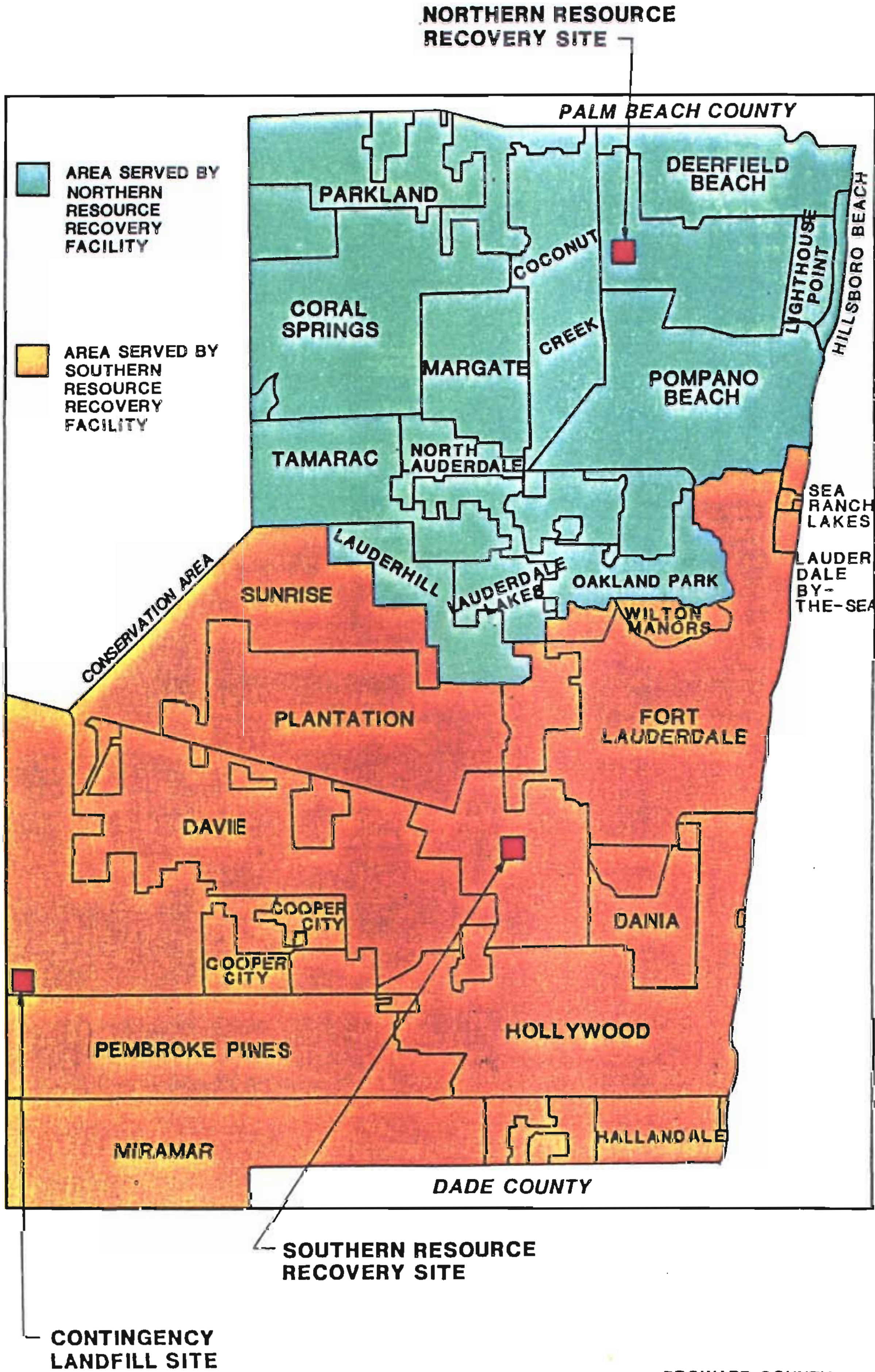
The Broward County Resource Recovery System has been selected as the best alternative for meeting Broward County's long-term solid waste disposal needs. This system will:

- o dispose of garbage and trash in an environmentally sound manner;
- o reduce the need for siting and developing a raw garbage landfill;
- o recover energy by using solid waste as a fuel to produce electricity and;

Broward County is proposing to develop as initial parts of the system two mass-burning resource recovery facilities, an ash residue landfill, and a contingency landfill site (see Figure 1.1.1). The proposed North Broward County facility, which is the subject of this Application, will be located on a 25 acre tract in unincorporated Broward County on Hilton Road (N.W. 48th Street) between Powerline Road and the Florida Turnpike.

1.2 Introduction

Broward County occupies an area of approximately 1,200 square miles and is located in the southeastern portion of the State of Florida. Broward County is bounded on the north by Palm Beach County, on the east by the Atlantic Ocean, on the south by Dade County and on the west by Hendry and Collier



BROWARD COUNTY

SERVICE AREAS SERVED BY BOTH NORTHERN AND SOUTHERN RESOURCE RECOVERY FACILITIES

Counties. The estimated 1985 population of the County was 1.1 million persons.

Over 1.3 million tons of solid waste are generated in Broward County each year. This amount is expected to increase to over 2 million tons by the year 2010. The County, at the present time, depends solely on landfills for disposing of solid waste. Given the present generation rate of solid waste (approximately 3,300 tons per day) the County's two landfills will reach the end of their useful lives within a few years. The County owned and operated landfill in Davie has been recently expanded to its maximum capacity, but will be completely filled in 1987. The Waste Management, Inc., Central Disposal Site located near Pompano Beach will be expanded in the next few years, but will reach its maximum capacity in the mid-1990's.

As in many other urban Florida counties, the expansion of existing or siting and development of new landfills has become increasingly difficult. The decreasing availability of land, stricter regulation of both the development and operation of landfills and neighborhood opposition have all contributed to this situation. At the same time, State policies have encouraged local governments to look more and more to the recovery of the material and energy resources found in solid waste.

In 1981, the Broward County Board of County Commissioners authorized an investigation of solid waste management alternatives. The following year, the Commission approved a plan which called for de-emphasizing landfilling as a primary means of solid waste disposal. Further studies led in 1983 to a decision to proceed with development of two resource recovery facilities utilizing mass burning technology. Mass burning is a mature technology which requires no pre-processing or sorting of wastes. Several hundred plants around the world utilize this technology.

1.3 North Broward County Resource Recovery Project

The proposed North Broward County Resource Recovery Facility will be designed to initially generate approximately 55.5 megawatts of electrical power using solid waste generated predominantly in the northern region of the County (see Figure 1.1.1 for the approximate boundaries of the facility's service area). In anticipation of future needs, certification is being sought for an ultimate electric generating capacity of 83.25 megawatts.

A petition was filed with the Florida Public Service Commission on November 21, 1985, under Section 403.519, F.S. and Section 25-22.80 of the Florida Administrative Code requesting a Determination of Need for the proposed facility. A copy of the petition is included in Appendix 10.6 of this Application. On January 7, 1986, the PSC unanimously granted Broward County's petition for the Project.

1.4 Consistency of Project with State Energy Policy

As early as 1974, the Florida Legislature recognized the need to look for new solutions to an ever growing solid waste problem. The Legislature found in the Florida Resource Recovery and Management Act (Section 403.702 (i)(e) F.S.) that "The failure or inability to economically recover material and energy resources from solid waste results in the unnecessary waste and depletion of our natural resources, and, therefore, maximum recycling and reuse of such resources must be considered goals of the State." Fla. Stat. §403.702(1)(e) (1985) (emphasis added).

The Florida Legislature acted by "protect the health, prosperity, and general welfare... of its citizens" declaring in chapter 84-198 of the Laws of Florida that the "combustion of solid waste by small power production facilities for the production of electricity not only represents conservation efforts well directed towards that goal, but also represents an environmentally preferred alternative to conventional solid waste disposal" for the State of Florida. Fla. Stat. §377.709(1) (1985) (emphasis added).

In a letter inviting local officials to attend a workshop on "Resource Recovery in Florida" in November 1985, Florida Governor Bob Graham wrote,

> "Programs which result in the substitution of resource recovery alternatives to direct landfilling are vital to the protection of Florida's fragile development. The utilization of municipal solid waste as a safe and abundant renewable energy resource represents a positive economic opportunity for many Florida communities... Recent technological advances have made resource recovery a viable option for small, growing populations as well as large urban areas. Experience in Florida indicates that resource recovery can reduce landfill area requirement by up to 90 percent, and at the same time produce valuable electricity and thermal energy for use or sale."

Broward County's proposed solid waste disposal system is consistent with the State's policy to pursue resource recovery as a long-term solution for waste disposal. The use of proven mass burn technology will provide a technically and economical feasible solution to the County's long-term disposal needs.

1.5 Consistency of Project with the State Plan Goals and Policies

The North Broward County Resource Recovery Project is consistent with the following goals and policies of the Florida State Comprehensive Plan adapted by the 1985 Florida Legislature:

GOAL: Water Resources

Florida shall assure the availability of an adequate supply of water for all competing uses deemed reasonable and beneficial and shall maintain the functions of natural systems and the overall present level of surface and groundwater quality.

POLICIES:

#5 Ensure that new development is compatible with existing local and regional water supplies.

#11 Promote water conservation an integral part of water management programs as well as the reuse

MALCOLM PIRNIE

of water of the lowest acceptable quality for the purpose intended.

#13 Identify and develop alternative methods of wastewater treatment, disposal and reuse of wastewater to reduce degradation of water resources.

GOAL: Energy

Florida shall reduce its energy requirements through enhanced conservation and efficiency measures in all end-use sectors, while at the same time prompting and increased use of renewable energy resources.

POLICIES:

#5 Reduce the need for new power plants by encouraging end-use efficiency, reducing peak demand, and using cost-effective alternatives.

#9 Promote the use and development of renewable energy resources.

GOAL: Hazardous and Nonhazardous Material and Waste

All solid waste, including hazardous waste, wastewater and all hazardous materials, shall be properly managed, and the use of landfills shall be eventually eliminated.

POLICIES:

#1 By 1995, reduce the volume of nonhazardous solid waste disposed of in landfills to 55 percent of the 1985 volume.

#7 Encourage the research, development, and implementation of recycling, resource recovery, energy recovery, and other methods of using garbage, trash, sewage, slime, sludge, hazardous waste, and other waste.

GOAL: Land Use

In recognition of the importance of preserving the natural resources and enhancing the quality of life of the state, development shall be direct to those areas which have in place, or have agreements to provide, the land and water resources, fiscal abilities, and the service capacity to accommodate growth in an environmentally acceptable manner.

POLICIES:

#3 Enhance the liveability and character of urban areas through the encouragement of an attractive and functional mix of living, working, shopping, and recreational activities.

#6 Consider, in land use planning and regulation, the impact of land use on water quality and quantity, the availability of land, water, and other natural resources to meet demands, and the potential for flooding.

GOAL: Public Facilities

Florida shall protect the substantial investments in public facilities that already exist, and shall plan for and finance new facilities to serve residents in a timely, orderly, and efficient manner.

POLICIES:

#1 Provide incentives for developing land in a way that maximizes the use of existing public facilities.

GOAL: Cultural and Historical Resources

By 1995, Florida shall increase access to its historical and cultural resources and programs and encourage the development of cultural programs of national excellence.

POLICIES:

#3 Ensure the identification, evaluation, and protection of archaeological folk heritage and historic properties of the state's diverse ethnic population.

#6 Ensure that historic resources are taken into consideration in the planning of all capital programs and projects at all levels of government, and that such programs and projects are carried out in a manner which recognizes the preservation of historic resources.

SECTION 2

SITE AND VICINITY CHARACTERIZATION

2.1 Site and Associated Facilities Delineation

2.1.1 Site Location

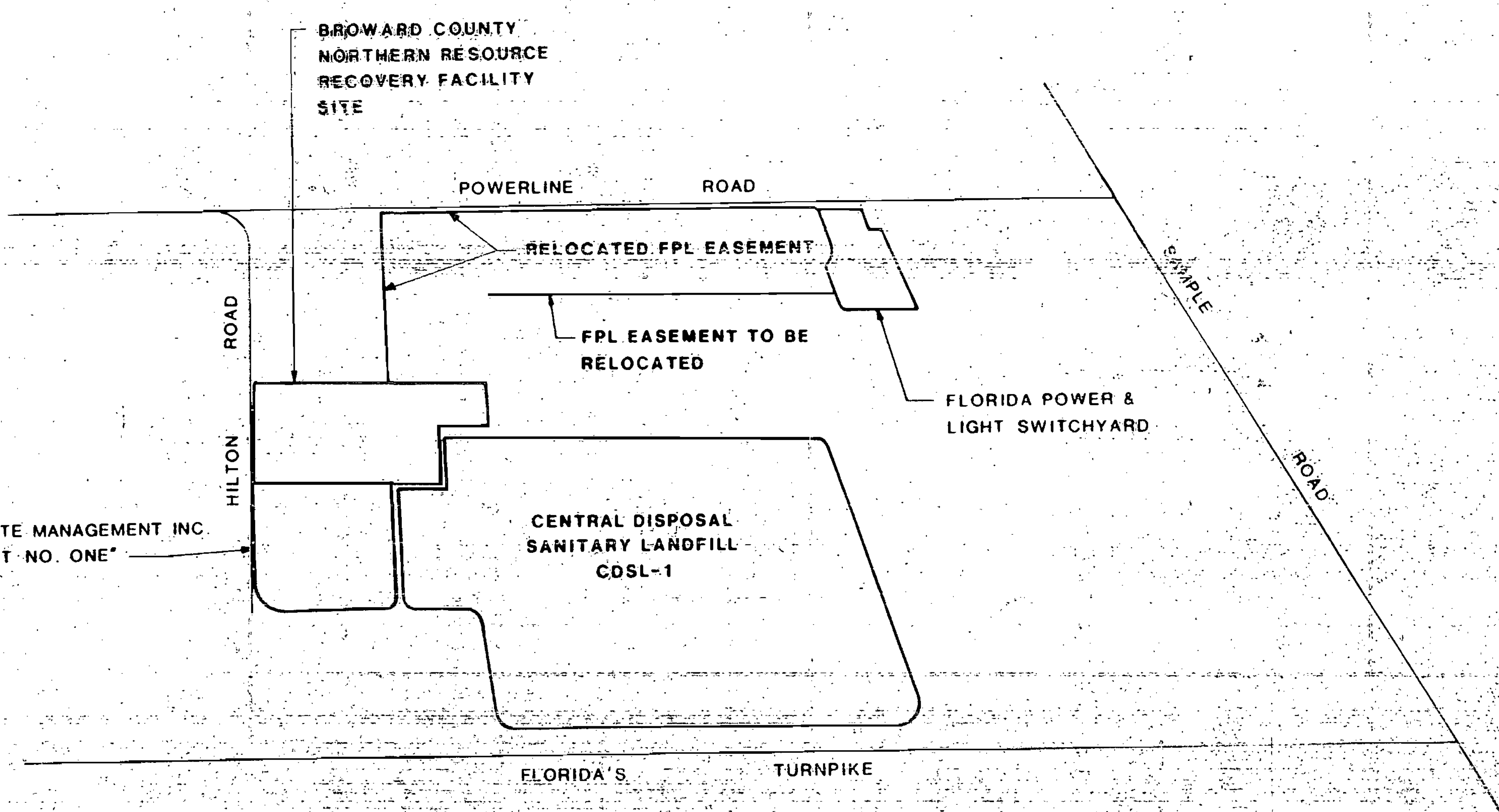
Drawing No. D-C-1, Plate 1 - Site Location with Easements and Property Lines of the Hilton Road Site, provides the current dimensions of the Project site. The 25 acre site is owned by Waste Management, Inc. and is located east of the Sunshine State Parkway (Florida Turnpike) and west of Powerline Road (N.W. 21st Avenue) on the south side of Hilton Road (N.W. 48th Street) in unincorporated Broward County between Deerfield Beach and Pompano Beach (Section 16, Township 48, Range 42).

2.1.2 Existing Uses

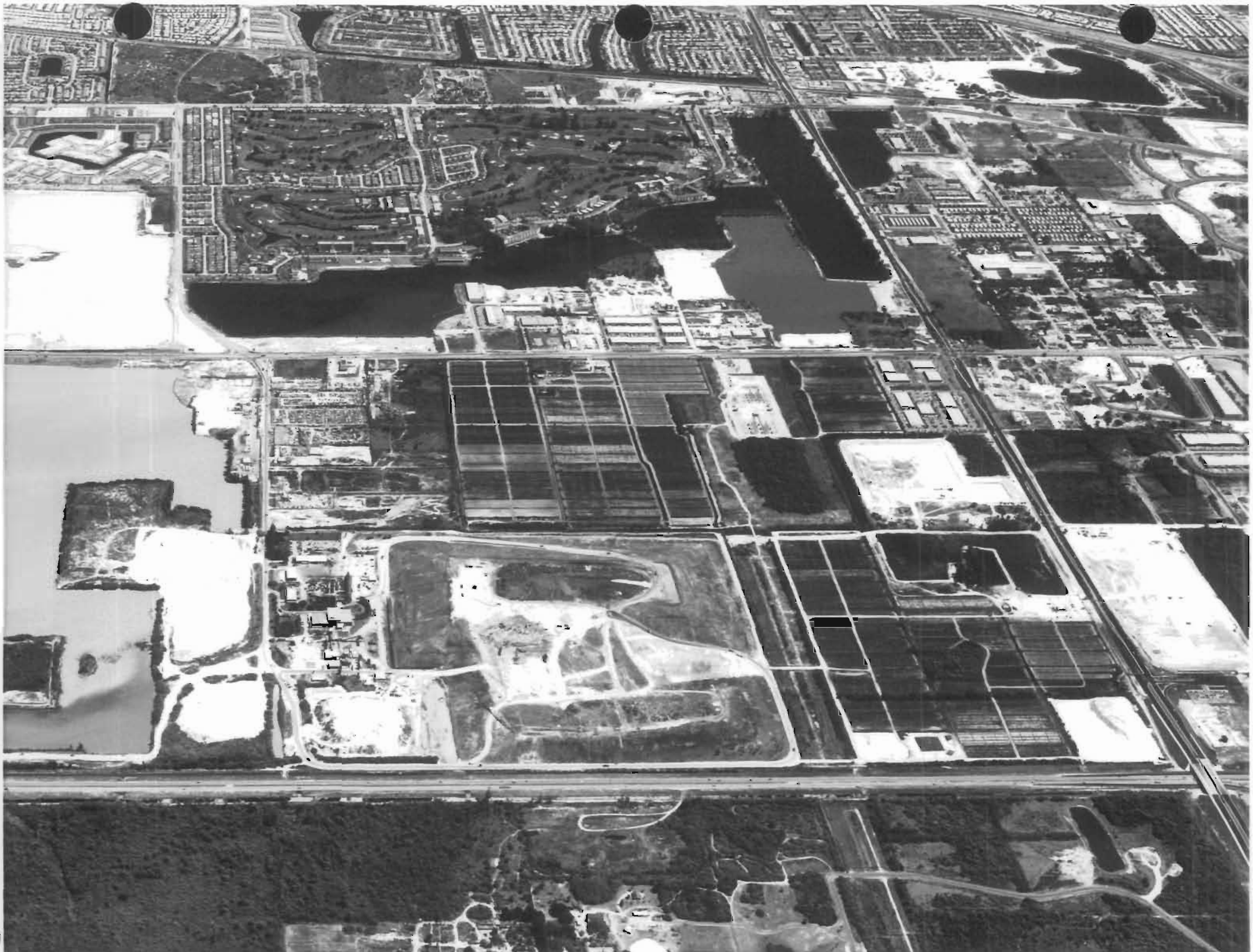
The Project site is vacant industrial property. It is bounded by a sanitary landfill to the west and the south and vacant industrial land to the east. Other uses between the Project site and Powerline Road on the south side of Hilton Road include auto salvage and repair buildings and welding and small engine repair shops. Paving and excavation operations are located on the north side of Hilton Road between the Turnpike and Powerline Road. A Florida Power and Light substation is located less than one-half mile south of the Project site. A more detailed description of transmission facilities is discussed in Section 6. An aerial photograph of the site is provided on the following page.

2.1.3 Site Modifications

The proposed site plan for the Project is shown in Figure 2.1.3.1. The Project site consists of a resource recovery facility, stormwater retention areas, an internal roadway system, a visitor/employee parking area and appropriate perimeter landscaping. The resource recovery facility will include a gatehouse/weigh station, receiving and handling



BROWARD COUNTY
NORTHERN RESOURCE
RECOVERY FACILITY
SITE
POWERLINE ROAD
RELOCATED FPL EASEMENT
ROAD
HILTON
FPL EASEMENT TO BE
RELOCATED
SAMPLE
ROAD
FLORIDA POWER &
LIGHT SWITCHYARD
WASTE MANAGEMENT INC.
"PLAT NO. ONE"
CENTRAL DISPOSAL
SANITARY LANDFILL
CDSL-1
FLORIDA'S TURNPIKE



Copyright 1985

Burch Air Photo Service, Inc.
208 SW 12th St. • Ft. Laud., FL 33315
(305) 523-1215 **Miami 945-1242**

Photo # BR 5312 SC **Date** 3-18-85

building, furnace boilers, turbine generators, ash disposal area, cooling system, and electrical substation.

As shown in Figure 2.1.3.1, the furnace, kiln and boiler areas extend rearward from the back wall of the crane building, which encloses the refuse pit and hopper floor. The electrostatic precipitators are located behind the boilers. These in turn are followed by the induced draft fans and the stacks. The turbine-generator structure is located in a peninsular arrangement to one side of the boilers. The transformer area is adjacent to the turbine-generator structure, with the take-off tower located on the side nearest the FP&L high voltage transmission lines. The cooling systems are located on the same side of the boilers as the turbine-generator structure and transformers, in order to minimize piping and electrical interconnections. The ash transfer conveyors and loadout facilities are located on the opposite side of the Plant from the turbine-generator structure, so located to minimize ash haul distances to the landfill.

Facility access will be via Hilton Road. Roadways supporting internal traffic will be designed to provide congestion-free circulation. The basic traffic flow will be east and west, to and from the receiving area. A more detailed description of the plant and its directly associated facilities is found in Section 3 of this application.

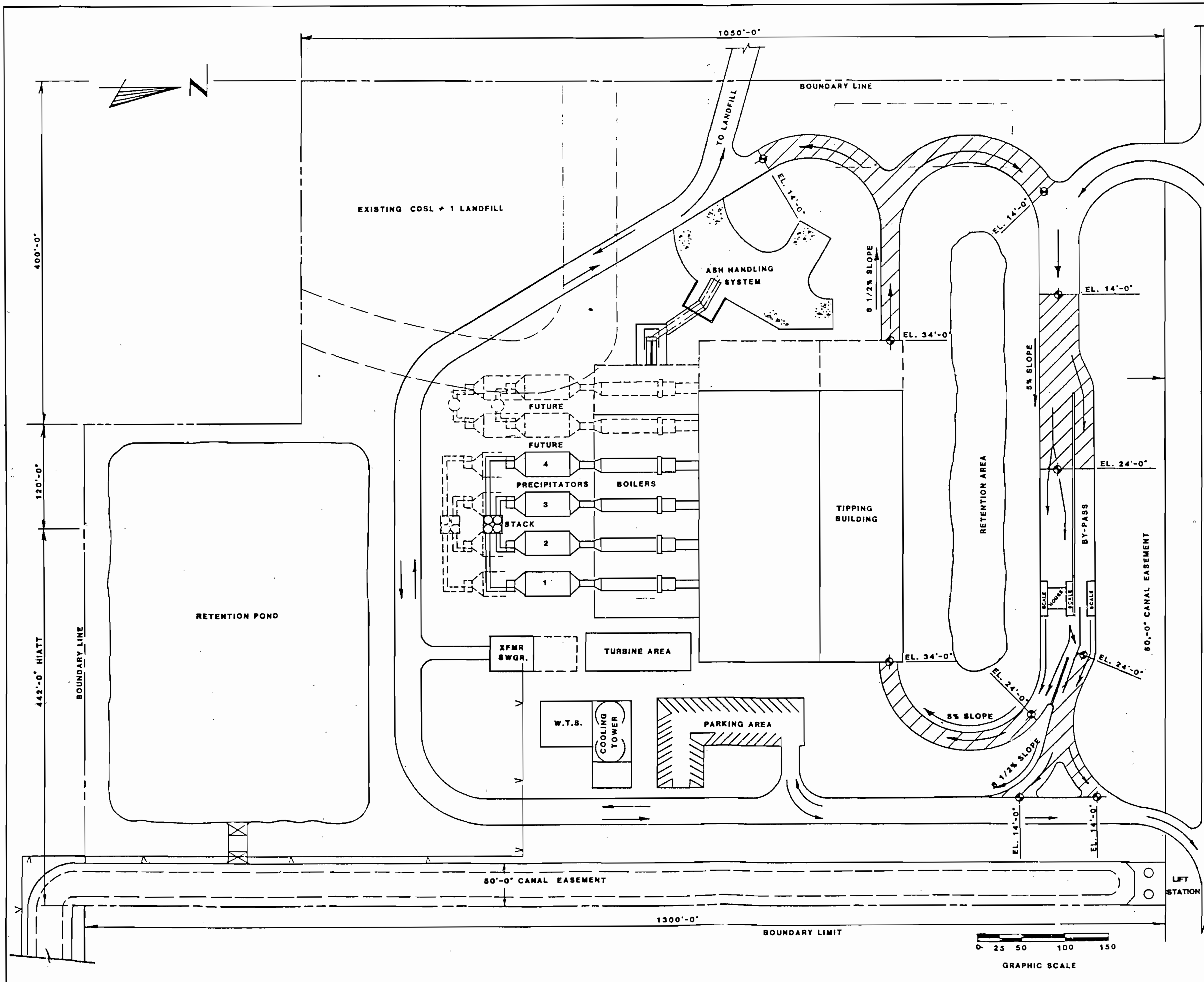
2.1.4 100-Year Flood Zone

As indicated in Figure 2.1.4.1, the proposed site is located within a 100-Year Flood Zone. Project site design criteria for this zone is elevation 14.0 MSL.

2.2 Socio-Political Environment

2.2.1 Governmental Jurisdictions

The area contained within a five-mile radius of the proposed facility is part of the metropolitan development area of Broward County and Palm Beach County.



REV.	DATE	DESCRIPTION	DR BY	APP BY
D	1/28/86	REDRAWN - CHANGED PLANT SITE LOCATION	JMU	
C	1/9/86	REDRAWN- CHANGED LOCATION OF PLANT ON SITE	JMU	
B	12/10/86	ADDED CANAL & DRAIN ES'MT.	JMU	
A	10/7/86	CHANGED ARRANGEMENT OF ROADS	JMU	

SCALE: GRAPHIC

PROJECT NO

PROJECT TITLE: NORTH BROWARD COUNTY RESOURCE RECOVERY PROJECT

DATE

DES BY

DR BY J. URQUHART 8/30/86

CHK BY

APP BY

SHEET TITLE: PLOT PLAN

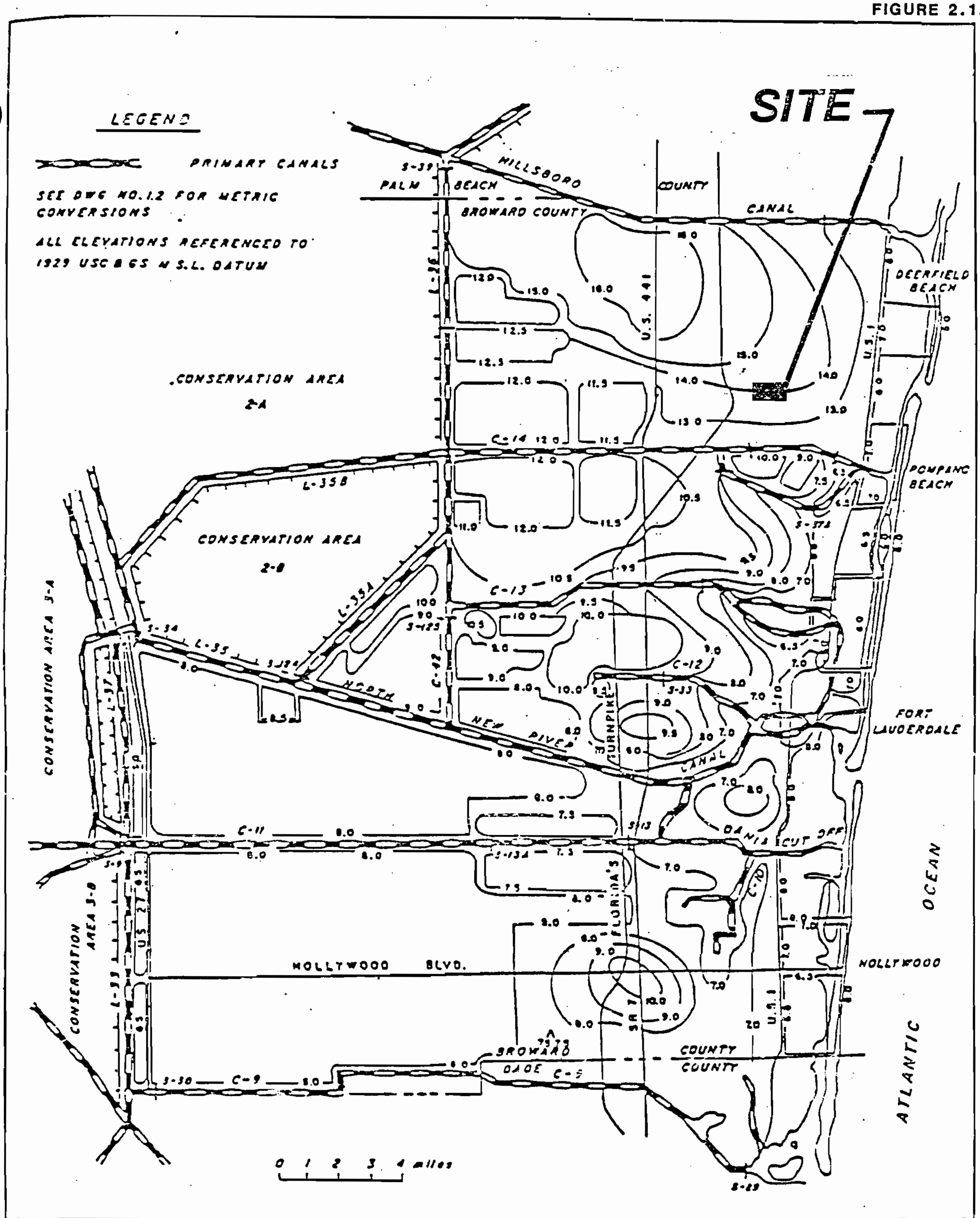
Waste Management Energy Systems, Inc.
10006 N. Dale Mabry Hwy
Tampa, Florida 33618

SHEET ____ OF ____

DRAWING NO

D-G-100

FIGURE 2.1.4.1



BROWARD COUNTY TRANSPORTATION DEPARTMENT WATER MANAGEMENT DIVISION	APPROVED 7-19-77 REVISED	100 YEAR FLOOD ELEVATION MAP	W. M. 13.1 1 OF 1 SHEETS

Note: Project Site Design Criteria for 100 Year Flood is Elevation 14.0 (M.S.L.)

The approximate boundaries of this area are:

- o North Boundary - 1/4 mile south of Glades Road (Palm Beach County)
- o East Boundary - Hillsboro Beach
- o South Boundary - McNab Road
- o West Boundary - 1/3 mile east of University Road

As shown on Figure 2.2.1.1, portions of the following cities in Broward County are within five miles of the site:

- o Coconut Creek
- o Pompano Beach
- o Lighthouse Point
- o Deerfield Beach
- o Parkland
- o Coral Springs
- o Margate
- o Hillsboro Beach

Also, a portion of the City of Boca Raton in Palm Beach County is within five miles of the site.

Local, regional, state and federal areas located within a five mile radius of the site were identified by contacting appropriate agencies and reviewing current maps and related literature. A list of all agency contacts appears in Section 9.

The following local, regional facilities have been identified on the five mile region map (Figure 2.2.1.1) and the one-mile map (Figure 2.2.1.1A):

Memorials and Monuments

Broward County

Forest Lawn Memorial Gardens

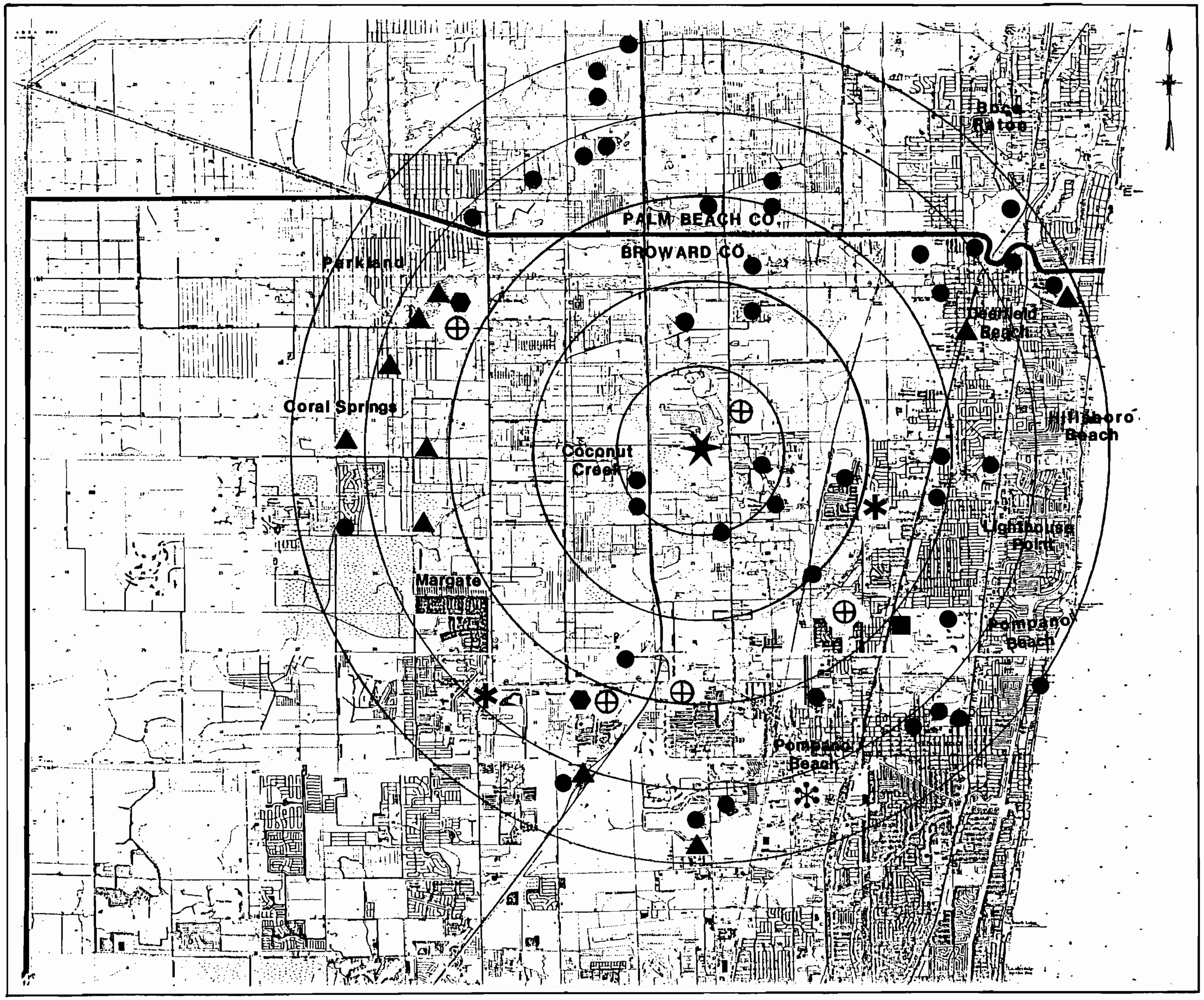
Palm Beach County
None

BEST AVAILABLE COPY

FIGURE 2.2.1.1

LEGEND

- Parks and Golf Courses
- Hospitals
- Unique Natural Areas
- Memorials
- Fire Station
- Police Station



SCALE:

0 1 2

MILES

MALCOLM PIRNIE

BROWARD COUNTY

GOVERNMENTAL JURISDICTIONS
AND
REGIONAL SCENIC, CULTURAL
AND
NATURAL LANDMARKS

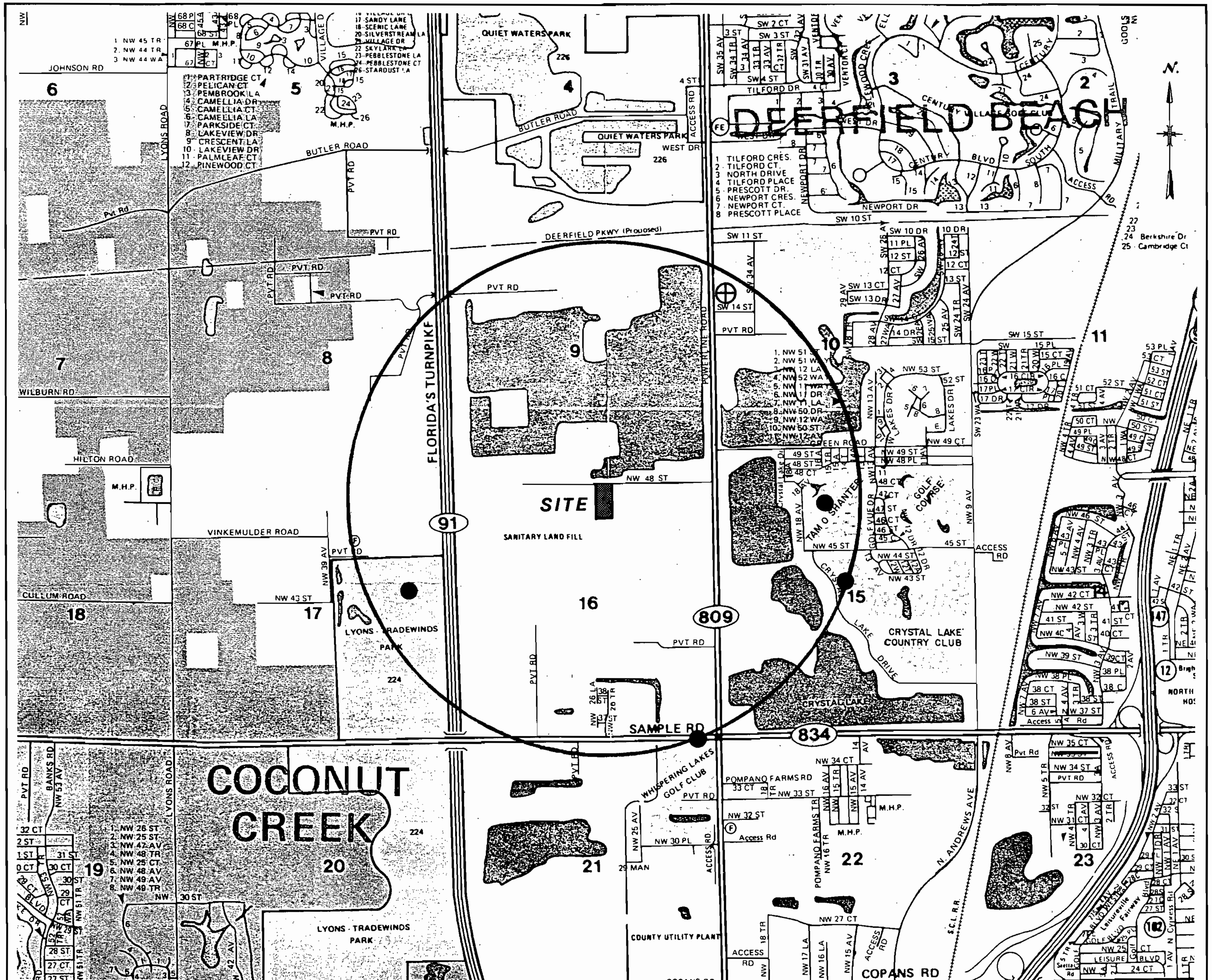
LEGEND

- Parks and Golf Courses
- Hospitals
- Unique Natural Areas
- Memorials
- Fire Station
- Police Station

SCALE

0 1/2 1

MILES



MALCOLM PIRNIE

BROWARD COUNTY

GOVERNMENTAL JURISDICTIONS AND REGIONAL SCENIC, CULTURAL AND NATURAL LANDMARKS

Parks and Golf Courses & Type of Ownership

Broward County

Fern Forest	County
Tradewinds N.	County
Tradewinds S.	County
Quiet Waters	County
Hillsboro	County
Deerfield Island	County
N. Broward Community Center	County
Pompano Beach Highlands	County
Sandspur	County
W. Pompano Beach Highland	County
Jaycee Park	City
Kester Park	City
Lyons Park	City
Municipal Baseball Complex (Pompano Beach)	City
Pioneer Park	City
Pompano Beach Public Park	City
Westside Community Center (Pompano Beach)	City
Westside Park (Deerfield Beach)	City

Palm Beach County

Hillsboro-El Rio Park Site	City
Sandalfoot Cove Park	County
Dulan/Davidson/Archdiocese	County

Private and Public

Broward County

Deer Creek Golf Course	Public
Deerfield County Club	Private
Century Village Golf Club	Private
Crystal Lake County Club	Private
Tam O'Shanter Golf Course	Private
Whispering Lakes Golf Club	Private
Leisureville Fairway	Private
Pompano Beach Country Club	Private
Palmaire Country Club	Private
Pompano Park Golf Course	Public
Martinique Village Golf Club	Private

Palm Beach County

Camino Del Mar Country Club	Semi-Private
Boca Del Mar Golf & Tennis Club	Semi-Private

Palm Beach County (cont'd)

Boca Pointe Golf & Racquet Club	Private
Boca Grove Golf & Tennis Club, Inc.	Private
Holiday Inn Lakeside	Public
Boca Lago Golf & Racquet Club	Private
Boca Rio Golf Club	Private
Sandalfoot Cove Country Club	Semi-Private
Hillsboro Country Club	Semi-Private

Unique Natural Areas and Areas of Critical State Concern

Broward County

Deerfield Expressway Site
Deerfield Isl. Park
Holmberg Road Site
Coconut Creek - Palm Aire Site
Express Creek Road Site
Deerfield Sand Pine Site
Holmberg Pond Apple Slough
Swamp 22 Site
Leitner Site
Ramors Site

Palm Beach County

None

Hospitals

Broward County

Cypress Community
Margate General
North Broward

Palm Beach County

None

Research has indicated that the presence of wildlife refuges, conservation lands, marine sanctuaries, or critical habitats of endangered species do not exist within five miles of the site.

2.2.2 Zoning and Land Use Plans

A zoning and land use chronology for the North Broward County Resource Recovery Project appears in Table 2.2.2.1.

Land Use

Between 1977 and 1984 the Broward County Board of County Commissioners adopted fifteen elements and subelements for the unincorporated area in conformance with the Local Government Comprehensive Planning Act of 1975 (Chapter 163, Florida Statutes).

The Broward County Land Use Plan (BCLUP), was adopted on November 9, 1977 (BC Ordinance #77-66, Appendix 10.3.2). Under the Broward County Charter, effective January 1, 1975, the County Land Use Plan became the official land use plan within the County and is effective within all local jurisdictions, including the unincorporated area, upon its adoption. Local jurisdictions submit their own land use plans to the County to be reviewed for certification with the County Land Use Plan. The Charter further states that within one year after the adoption of the BCLUP, local zoning, as to permitted uses and densities, must be in compliance with the Plan and/or certified local land use plan for the area concerned.

The primary goal of the BCLUP is to:

> "encourage the private and public sectors to adhere to patterns of planned development in Broward County which will promote environmental protection, recognize the finite nature of certain natural resources, strive to meet the County's social and economic needs, and reflect the goals and aspirations of the people in Broward County"

TABLE 2.2.2.1

NORTH BROWARD COUNTY
RESOURCE RECOVERY PROJECT
ZONING AND LAND USE CHRONOLOGY

June 10, 1966	Broward County Board of County Commissioners holds a public hearing on rezoning request No. 21-2-66 for the North One-Half (N 1/2) of the Northeast Quarter (NE 1/4) of Section 16. Township 48 South. Range 42 East less the East 880 feet of the North 755 feet thereof from A1: Limited Agricultural to M-4: Limited Heavy Industrial (Hilton Road Site).
June 28, 1966	Broward County Board of County Commissioners unanimously approves rezoning request No. 21-Z-66 from A1: Limited Agricultural to M-4: Limited Heavy Industrial (Hilton Road Site).
November 9, 1977	Broward County Board of County Commissioners adopts a Comprehensive Land Use Plan for the unincorporated area.
January 25, 1983	Broward County Board of County Commissioners authorizes staff to obtain appraisals, title information, owners' authority to proceed to rezone and to proceed with rezoning and begin negotiations toward the acquisition of two resource recovery/ash residue disposal sites.
April 12, 1983	Broward County Board of County Commissioners adopt the recommendations of the March 1983 Site Evaluation Report prepared by Malcolm Pirnie, Inc. and authorizes staff to secure all necessary information and to conduct negotiations for acquisition of the Route 441 and the Copans Road site for resource recovery/disposal facilities.
July 6, 1983	Broward County Zoning Board approves at a public hearing the rezoning of the Copans Road Resource Recovery Project Site from A-1, Limited Agricultural: A-3, Agricultural Utility; and M-3, General Industrial to Planned Unit Development for Special Complexes (PUD) by a vote of 8-2 (Rezoning Petition No. 28-2-83).
August 12, 1983	Broward County Board of Commissioners approves the rezoning of the Copans Road Resource Recovery Project Site from A-1, Limited Agricultural: A-3, Agricultural Utility: and M-3 General Industrial to Planned Unit Development for Special Complexes (PUD) at a public hearing (Ordinance No. 48-2) as recommended by the Broward County Zoning Board on July 6, 1983.
September 1, 1983	City of Pompano Beach annexes an area between Sample Road and Coconut Creek Parkway which includes the site of the Copans Road Resource Recovery Project.

TABLE 2.2.2.1 (continued)

NORTH BROWARD COUNTY
RESOURCE RECOVERY PROJECT
ZONING AND LAND USE CHRONOLOGY

October 18, 1983	Pompano Beach City Commission directs city attorney to begin rezoning of Copans Road Resource Recovery Project.
November 1, 1983	County and Deputy County Administrators and County Engineering consultants participants in Workshop with City Commissioners in Pompano Beach on the Resource Recovery Program to persuade the Commission to retain County zoning on Copans Road project site.
December 28, 1983	City of Pompano Beach Planning and Zoning Board holds a Public Hearing on the Copans Road Resource Recovery Project site. The hearing is continued until January 25, 1984 at request of the County to allow the County time to review the City Planning Department's report on the rezoning request.
January 25, 1984	City of Pompano Beach Planning and Zoning Board votes to recommend to the City Commission that the Copans Road Resource Recovery Project site zoning be changed from the existing County designation of Planned Unit Development for Special Complexes to the City's Highway Light Industrial or 1-1 zoning which does not allow resource recovery uses.
February 21, 1984	Pompano Beach City Commission and Broward County Commission hold a "Summit of Sorts" in Pompano Beach to attempt to discuss and negotiate the development of the Copans Road Resource Recovery Project. Differences of opinion on the use of the site were not resolved at this meeting. However, both Commissions indicated a willingness to continue discussion and negotiations.
February 28, 1984	First reading of City of Pompano Beach rezoning application for the area involving the County's Copans Road Resource Recovery Project site.
March 6, 1984	Second reading of the City of Pompano Beach rezoning application for the area involving the County's Copans Road Resource Recovery Project site. The City Commission approves the rezoning of the site from the County's for Special Complexes to the City's zoning of Highway Light Industrial (I-1).
April 3, 1984	Broward County Board of Commissioners authorities the General Counsel's Office to initiate the appropriate legal action against the City of Pompano Beach relating to the rezoning of the Copans Road Resource Recovery Project site.

TABLE 2.2.2.1 (continued)

NORTH BROWARD COUNTY
RESOURCE RECOVERY PROJECT
ZONING AND LAND USE CHRONOLOGY

June 8, 1984	Seventeenth Judicial Circuit Court denies County's petition to void City of Pompano Beach Highway Light Industrial (I-1) zoning at the Copans Road Resource Recovery site and instructs County to seek a special variance from the City.
June 19, 1984	Broward County Board of County Commissioners authorities the Broward Broward County General Counsel's Office to appeal to the Fourth District Court of Appeal the case of Broward County v. City of Pompano Beach, Case No. 84-7687 CU (Agenda Item No. 50) regarding the zoning of the Resource Recovery Project site.
July 9, 1984	Broward County Office of General Counsel files 1.) a petition for a Writ for Certiorarai; 2.) a petition requesting an abbreviated response time for the Writ and 3.) a petition requesting a hearing for an oral argument with the Fourth District Court of Appeals concerning the rezoning of the Copans Road Resource Recovery Project site by Pompano Beach.
September 5, 1984	Meeting between Broward County Board of County Commissioners and City of Pompano Beach administrative officials in Pompano Beach to discuss siting of Resource Recovery Project on Copans Road.
October 1, 1984	County Administrator and staff meet with City of Pompano Beach Planning Director and economic development consultants at the County Governmental Center to review the City's Master Plan for Industrial Development and its impact on the Copans Road Resource Recovery Project.
November 21, 1984	Fourth District Court of Appeals issues an order denying Broward County's petition for Writ of Certiorari affecting Copans Road Resource Recovery Project.
December 6, 1984	Broward County petitions the Fourth District Court of Appeals for a rehearing on the Copans Road Resource Recovery Project Site rezoning issue.
December 10, 1984	County Administrator and Director of County's Office of Planning Plan Implementation Division meet with Pompano Beach City Manager and Planning Director in Pompano Beach to discuss Copans Road Resource Recovery Project.
December 13, 14, 17, 19 & 21, 1984; January 2, 3, & 8, 1985	County Office of Planning Plan Implementation Division Director and Pompano Beach Planning Director meet in Pompano Beach concerning Copans Road Resource Recovery Project.

TABLE 2.2.2.1 (continued)

NORTH BROWARD COUNTY
RESOURCE RECOVERY PROJECT
ZONING AND LAND USE CHRONOLOGY

January 15, 1985	County Administrator and Office of Planning, Plans Implementation Division Director meet with Pompano Beach City Commission.
January 31 & 5, 19 & 26, March 12, 1985	County Administrator and staff meet with City of Pompano Beach February Fact-Finding Committee in Pompano Beach concerning Copans Road Resource Recovery Project.
March 21, 1985	Fourth District Court of Appeal denies Broward County's Motion for Rehearing in the case of Broward County vs. City of Pompano Beach, Case No. 84-1470, filed by the County against the City challenging the City's denial of the use of the County's Copans Road property in Pompano Beach for a resource recovery site.
April 18, 1985	Broward County Board of County Commissioners directs staff to proceed with necessary steps for 1.) rezoning; 2.) filing a Power Plant Siting Certification Application with the State of Florida Department of Environmental Regulation for the same site and 3.) possible deannexation of the North Broward County Resource Recovery Project site on Copans Road in the City of Pompano Beach.
May 31, 1985	The prequalified full service vendors, Signal RESCO, Inc. and Waste Management, Inc., submit "final and best offer" proposals for the Resource Recovery Project. In addition to its base proposals, Waste Management also proposes a site adjacent to its Central Disposal Sanitary Landfill site on N.W. 48th Street (Hilton Road) as an alternate location for the North Resource Recovery Project.
June 27, 1985	Broward County Planning Council approves a letter prepared by Council's Counsel to be sent in reply to a question from County Commission Vice Chairman G. Thompson stating: 1. A utility is a permitted use under the Industrial Land Use designation of the Broward County Unincorporated Area Land Use Plan. A resource recovery facility would be interpreted as a utility by the Council and, as such, would be a permitted use; and 2. The Community Facilities (C.F.-1) Zoning District of the City of Pompano Beach included and permits, among other things, utility structures, and by special exception, solid waste disposal and transfer sites (Resource Recovery Facilities) is consistent with the Industrial Land Use designation under the Broward County Unincorporated Land Use Plan.

TABLE 2.2.2.1 (continued)

NORTH BROWARD COUNTY
RESOURCE RECOVERY PROJECT
ZONING AND LAND USE CHRONOLOGY

July 2, 1985	Broward County Board of County Commissioners select Waste Management as the full-service vendor for the North Broward County Resource Recovery Project.
July 1, 1985	Broward County Office of Planning staff files rezoning and use variance applications with the City of Pompano Beach Planning Department to permit the use of a resource recovery facility on Copans Road.
July 24, 1985	City of Pompano Beach Planning and Zoning Board unanimously denies Broward County's request to rezone the Copans Road Resource Recovery Project site from Highway Light Industrial (I-1) to Community Facilities (CF-1).
August 13, 1985	Broward County Board of County Commissioners authorize staff to negotiate with Waste Management, Inc. for the siting of the Northern Resource Recovery Facility adjacent to its Central Disposal Sanitary Landfill site on Hilton Road (N.W. 48th Street).
September 3, 1985	Broward County withdraws its applications for rezoning and variance for the Copans Road (North) Resource Recovery Project.
February 5, 1986	Waste Management files a rezoning application with the Broward County Office of Planning to change the Zoning of the Hilton Road Resource Recovery Project site from M-4: Limited Heavy Industrial and A-6: Agricultural - Disposal to Planned Unit Development for Special Complexes (PUD).

The Unincorporated Area Land Use Element (UALUE) was adopted on September 4, 1979 to determine future land use patterns in the unincorporated areas of the County.

The Project site is designated industrial on the BLCUP and the Unincorporated Area Land Use Element. Resource Recovery is a utility (for solid waste disposal) and as such, is an allowable use under an industrial land use designation. Therefore, the Project is consistent with and meets the goals and objectives of the BCLUP and UALUE. The Project is also consistent with the Traffic Circulation and Mass Transit, Drainage, Coastal Zone, Conservation, Aviation, Utility, Economic Development, Solid Waste and Intergovernmental Coordination Elements of the Comprehensive Plan (see Table 2.2.2.2).

Figures 2.2.2.1 and 2.2.2.1(A) illustrates the major surrounding land use categories for a 5 mile radius around the site. The major land use categories are:

- o Low Residential
- o Medium Residential
- o High Residential
- o Commercial
- o Industrial
- o Agricultural

Using Level II categories of the Florida Land Use and Cover Classification System, additional land uses are provided for the 5 mile area around the site on Figures 2.2.2.2 and 2.2.2.2(A).

Zoning

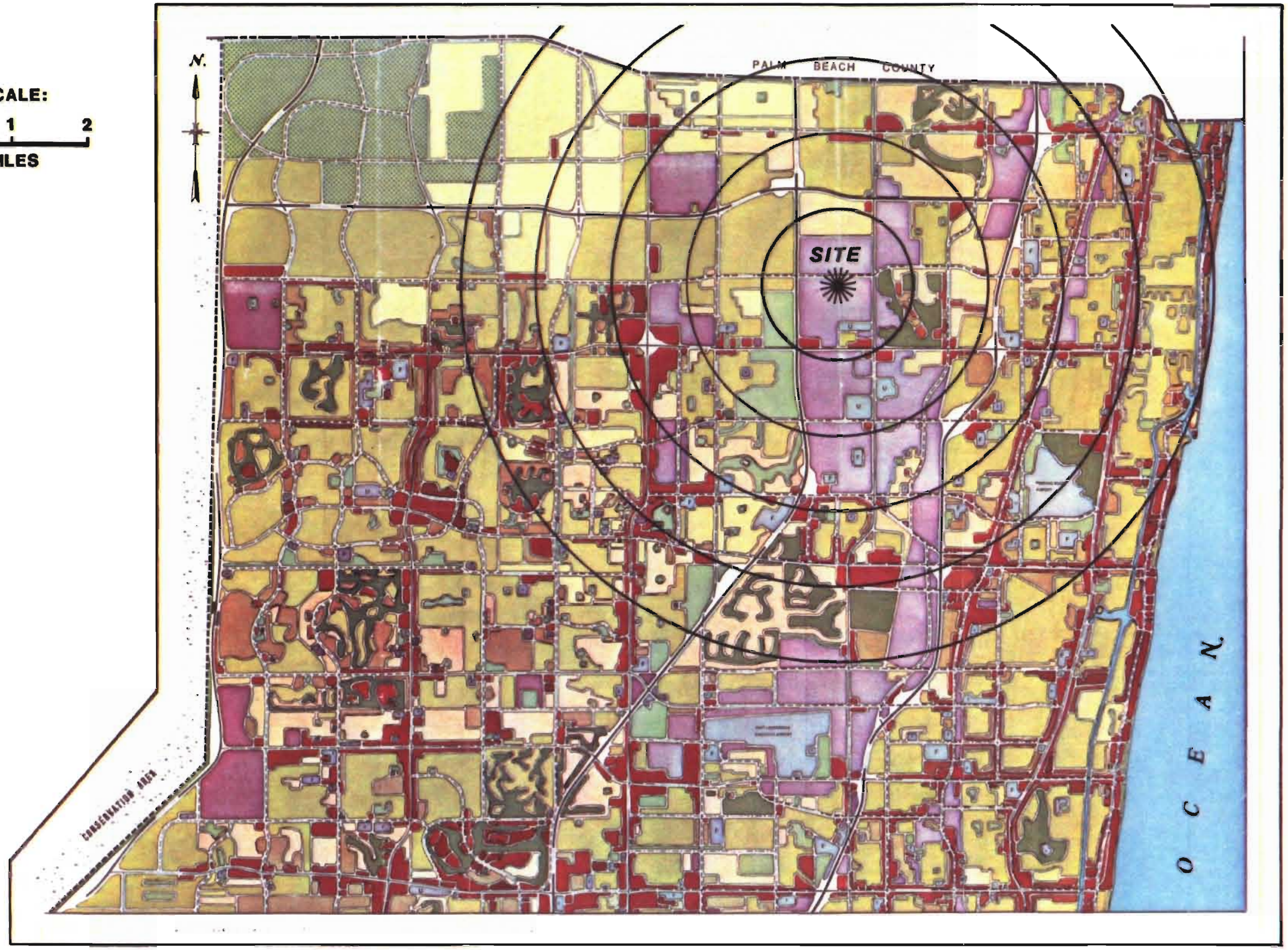
All requests for changes in zoning classification must be consistent with the Comprehensive Plan in addition to meeting

MALCOLM PIRNIE

LEGEND:

- ESTATE (Approximate 1 unit/acre)
- LOW (3) (Approximate 1-3 du/ac)
- LOW (5) (Approximate 3-5 du/ac)
- LOW MEDIUM (Approximate 5-10 du ac)
- MEDIUM (Approximate 10-16 du/ac)
- MEDIUM HIGH (Approximate 16-25 du/ac)
- HIGH (Approximate 25-50 du/ac)
- COMMERCIAL
- OFFICE
- INDUSTRIAL
- PARKS AND RECREATION
- COMMERCIAL RECREATION
- AGRICULTURE (du's subject to local Plans)
- CONSERVATION AREA
- F COMMUNITY FACILITIES
- U UTILITIES
- TRANSPORTATION-PORT & AIRPORTS (see also Trafficways/Transportation)

SCALE:
0 1 2
MILES

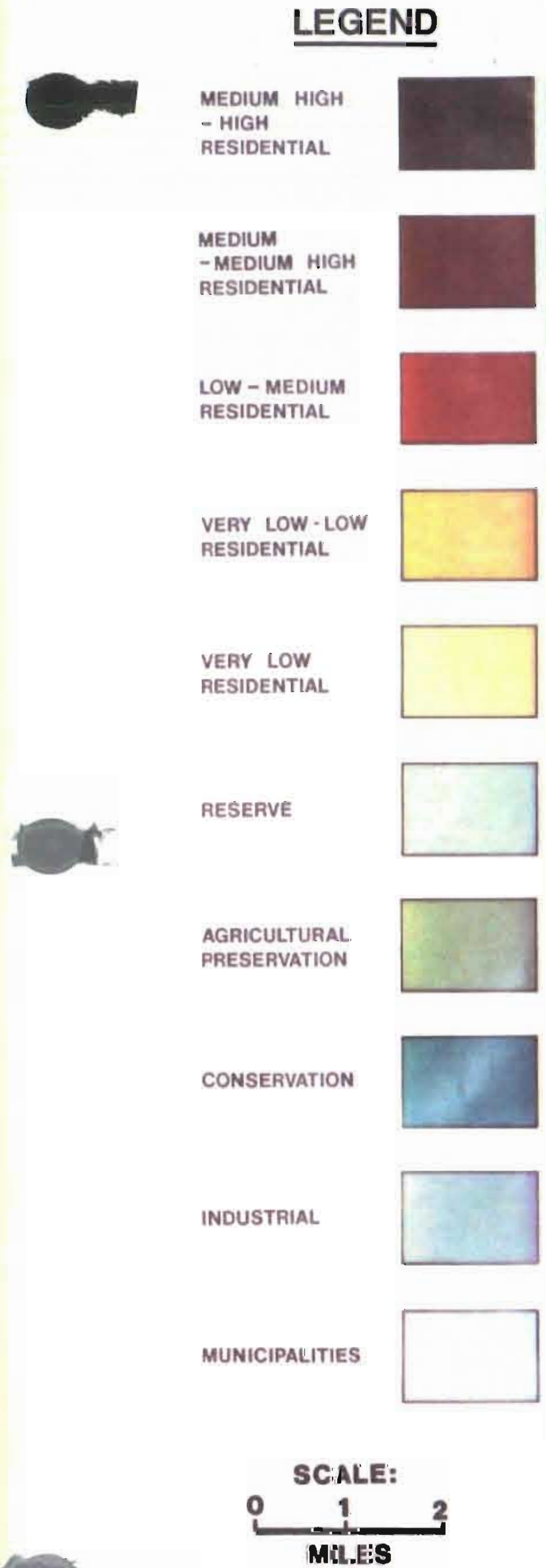


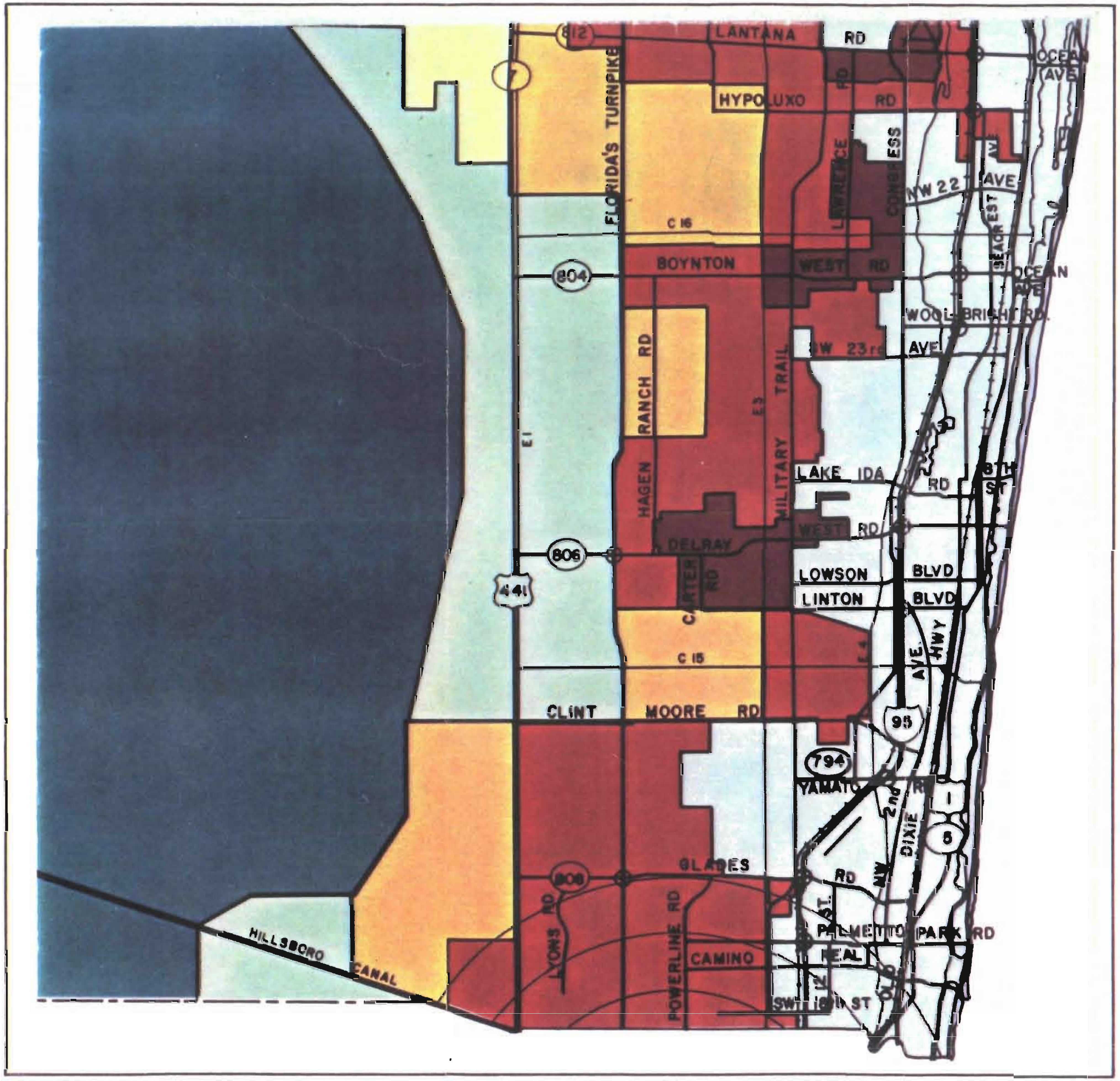
Source: Broward County Planning Council

MALCOLM PIRNIE

BROWARD COUNTY
LAND USE MAP
FIVE MILE RADIUS
1983

FIGURE 2.2.2.1(A)





Source: Palm Beach County Planning Council

MALCOLM PIRNIE

PALM BEACH COUNTY

LAND USE MAP
UPPER LIMIT OF
FIVE MILE RADIUS
1983

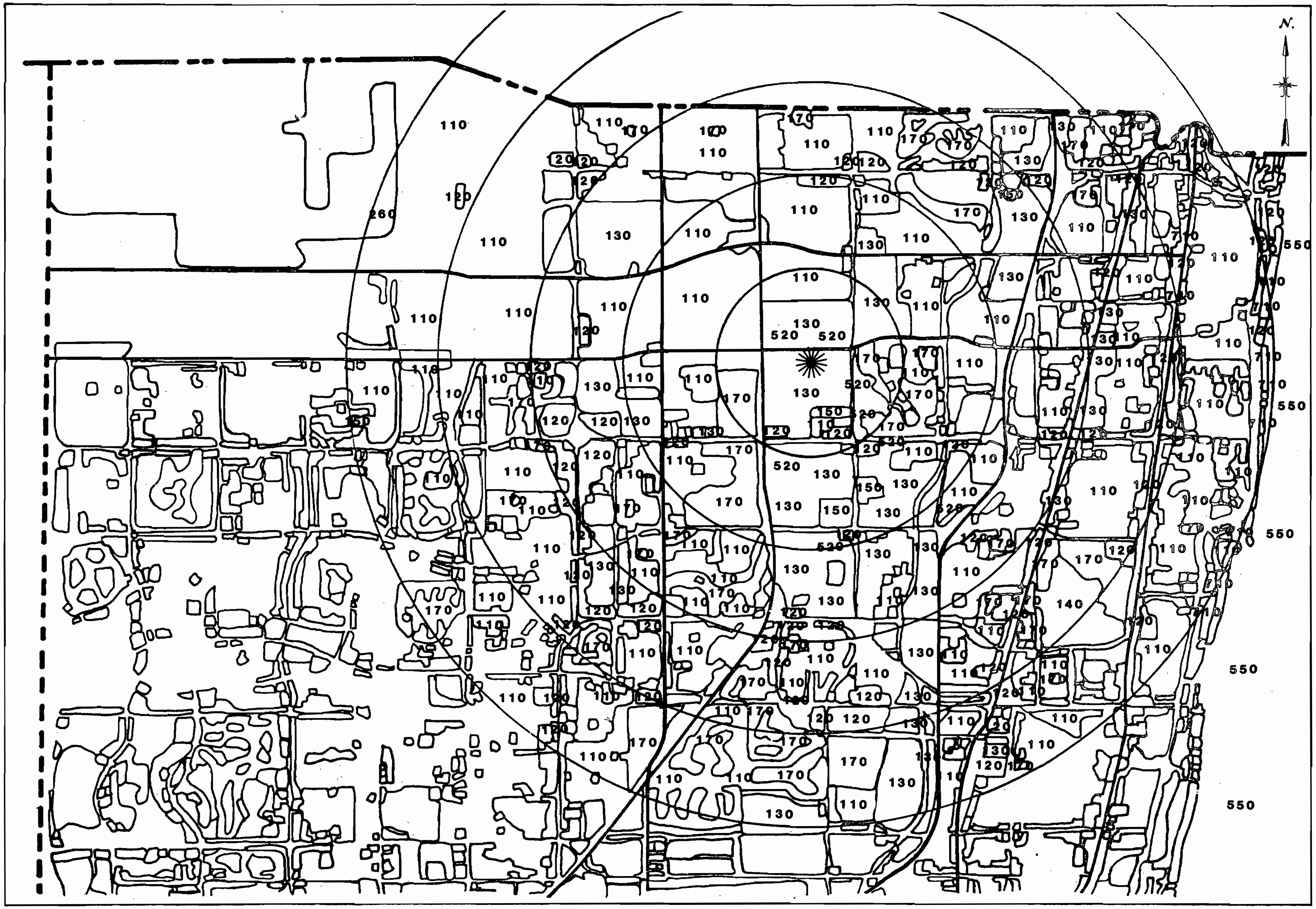
FLORIDA LAND USE AND COVER CLASSIFICATION SYSTEM (LEVEL II)

110 RESIDENTIAL
120 COMMERICAL & SERVICES
130 INDUSTRIAL
140 TRANSPORTATION
150 COMMUNICATIONS & UTILITIES
160 INSTITUTIONAL
170 RECREATIONAL
180 MIXED
190 OPEN LAND & OTHER
210 CROPLAND & PASTURELAND
220 ORCHARDS, GROVES (EXCEPT CITRUS)
230 CITRUS GROVES
240 CONFINED FEEDING OPERATIONS
250 SPECIALITY FARMS
260 OTHER AGRICULTURE
310 GRASSLAND
320 SHRUB AND BRUSHLAND
330 MIXED RANGELAND
410 CONIFEROUS FOREST
420 HARDWOOD FOREST
430 MIXED FOREST
440 PLANTED FREST FOREST
450 CLEARCUT AREAS
510 STREAMS & CANALS
520 LAKES
530 RESERVOIRS
540 BAYS & ESTUARIES
550 OPEN MARINE WATERS
560 OTHER WATER AREAS
610 WETLAND-CONIFEROUS FOREST
620 WETLAND-HARDWOOD FOREST
630 WETLAND-MIXED FOREST
640 WETLAND-VEGETATED, NON-FORESTED
650 NON-VEGETATED WETLANDS
710 BEACHES
720 SAND OTHER THAN BEACHES
730 EXPOSED ROCK
740 ALTERED LANDS
750 EXTRACTIVE
760 OTHER BARREN LANDS

SCALE:

0 1 2

MILES



BROWARD COUNTY

RESOURCE RECOVERY PROJECT
EXISTING LAND USE
5-MILE AREA

1983

FLORIDA LAND USE AND COVER CLASSIFICATION SYSTEM (LEVEL II)

110 RESIDENTIAL
120 COMMERICAL & SERVICES
130 INDUSTRIAL
140 TRANSPORTATION
150 COMMUNICATIONS & UTILITIES
160 INSTITUTIONAL
170 RECREATIONAL
180 MIXED
190 OPEN LAND & OTHER
210 CROPLAND & PASTURELAND
220 ORCHARDS, GROVES (EXCEPT CITRUS)
230 CITRUS GROVES
240 CONFINED FEEDING OPERATIONS
250 SPECIALITY FARMS
260 OTHER AGRICULTURE
310 GRASSLAND
320 SHRUB AND BRUSHLAND
330 MIXED RANGELAND
410 CONIFEROUS FOREST
420 HARDWOOD FOREST
430 MIXED FOREST
440 PLANTED FREST FOREST
450 CLEARCUT AREAS
510 STREAMS & CANALS
520 LAKES
530 RESERVOIRS
540 BAYS & ESTUARIES
550 OPEN MARINE WATERS
560 OTHER WATER AREAS
610 WETLAND-CONIFEROUS FOREST
620 WETLAND-HARDWOOD FOREST
630 WETLAND-MIXED FOREST
640 WETLAND-VEGETATED, NON-FORESTED
650 NON-VEGETATED WETLANDS
710 BEACHES
720 SAND OTHER THAN BEACHES
730 EXPOSED ROCK
740 ALTERED LANDS
750 EXTRACTIVE
760 OTHER BARREN LANDS

SCALE:

0 1 2

MILES

PALM BEACH COUNTY

RESOURCE RECOVERY PROJECT
EXISTING LAND USE
5-MILE AREA

1983

TABLE 2.2.2.2

CONSISTENCY WITH THE COMPREHENSIVE PLAN[1]

Element of Comprehensive Plan	Project Consistency Summary
Solid Waste	o The energy recovery facility is the culmination of years of solid waste management planning.
Economic	o There will be no externalized impacts from the facility, the system will employ proven technology, and the program is more economically sound than landfilling.
	o The energy recovery facility is a new industry for Broward County.
	o Resource recovery has long-term beneficial economic, environmental and societal impact to the County.
Land Use	o The energy recovery facility is interrelated with other light industrial activities in the area.
	o The energy recovery facility incorporate modern design techniques. The facility will not have adverse external impacts and is compatible with the surrounding area.
Traffic Circulation and Mass Transit	o The site location minimizes truck route distances for solid waste collection and disposal.
Aviation	o The project will be in compliance with the Federal Aviation Administration regulations.
Port Everglades	o This element is not directly applicable to the proposed project.
Housing	o The energy recovery facility will not impact the creation or maintenance of healthy and viable living environment.
Water and Sewer	o The North Regional Wastewater Treatment Plant will treat discharges from the energy recovery facility. Plant effluent will be reused as cooling make-up.
Drainage	o The proposed stormwater drainage system meets the requirements of the South Florida Water Management District and DER.

TABLE 2.2.2.2 (continued)

CONSISTENCY WITH THE COMPREHENSIVE PLAN[1]

Element of Comprehensive Plan	Project Consistency Summary
Utility	o The energy recovery facility helps Florida Power and Light meet its goals and objectives in the Electric Utility Subelement.
Conservation	o The energy recovery facility was sited to avoid impacts to conservation/reservation areas.
Coastal Zone Protection	o The energy recovery facility was sited in an area advantageous for this type of development with the least undesirable impact on both the natural and the built environment.
Intergovernmental Coordination	o Power Plant Siting Act process includes coordination of the Project with comprehensive planning.

1. This table does not present all of the policy statements of the Comprehensive Plan. It shows the general thrust of the policies in each element and the general consistency of the Project.

all requirements of the Broward County Zoning Ordinance and other applicable county, state and federal laws. The site is currently zoned M-4 - Limited Heavy Industrial and A-6 - Agricultural-Disposal. A rezoning application was filed February 1986 requesting this zoning classification be changed to Planned Unit Development for Planned Special Complexes (PUD). The rezoning request for PUD is in conformance with the permitted nonresidential uses listed under Section 39-883(b)(3) of the Broward County Zoning Code. This is the same zoning classification used for the South Broward County Resource Recovery Facility at State Roads 84 and 7.

The rezoning is scheduled to be reviewed by the Broward County Development Review Committee, the Zoning Board, and the Broward County of County Commissioners by April 1986.

2.2.3 Demography and Ongoing Land Use

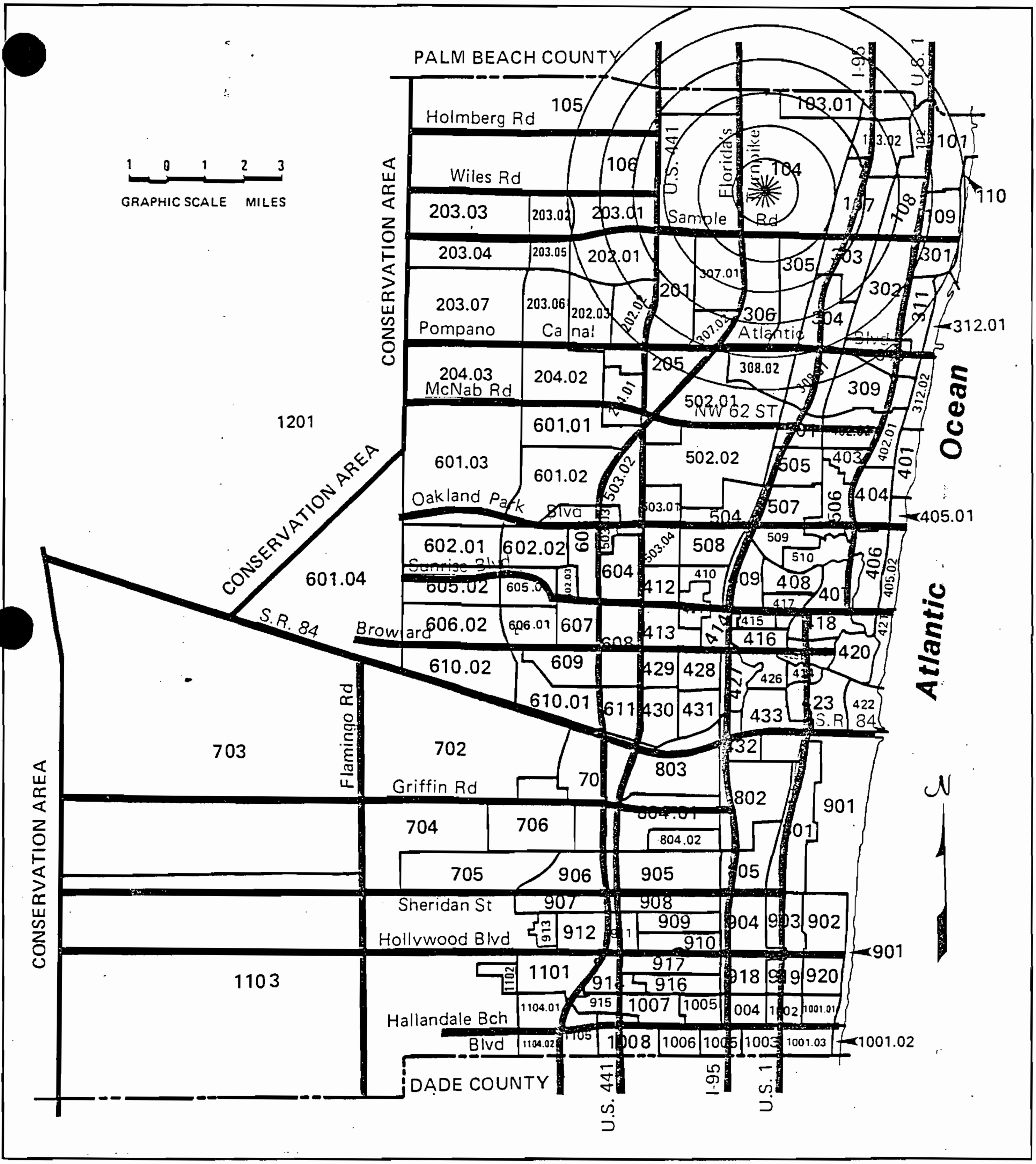
Figure 2.2.3.1 is a 1980 census tract map of Broward County and Figure 2.2.3.1(A) is a 1980 census tract map of Palm Beach County. Existing resident population data corresponding to each census tract for each County is presented in Table 2.2.3.1 and Table 2.2.3.1(A). Resident population by municipality is provided for Broward County in Table 2.2.3.2 and for the City of Boca Raton in Table 2.2.3.2(A).

As illustrated in the previous section on Figures 2.2.2.1, 2.2.2.1(A), 2.2.2.2 and 2.2.2.2(A), the ongoing land use for the five mile area surrounding the site is primarily low residential and light industrial. Details for both the five mile and one mile radii are provided on these drawings. Detailed information on vegetation and land use is provided in Section 2.3.5.

2.2.4 Easements, Title, Agency Works

The Project site consists of one 25 acre parcel under the ownership of Waste Management, Inc. of Florida (Plate 1).

FIGURE 2.2.3.1



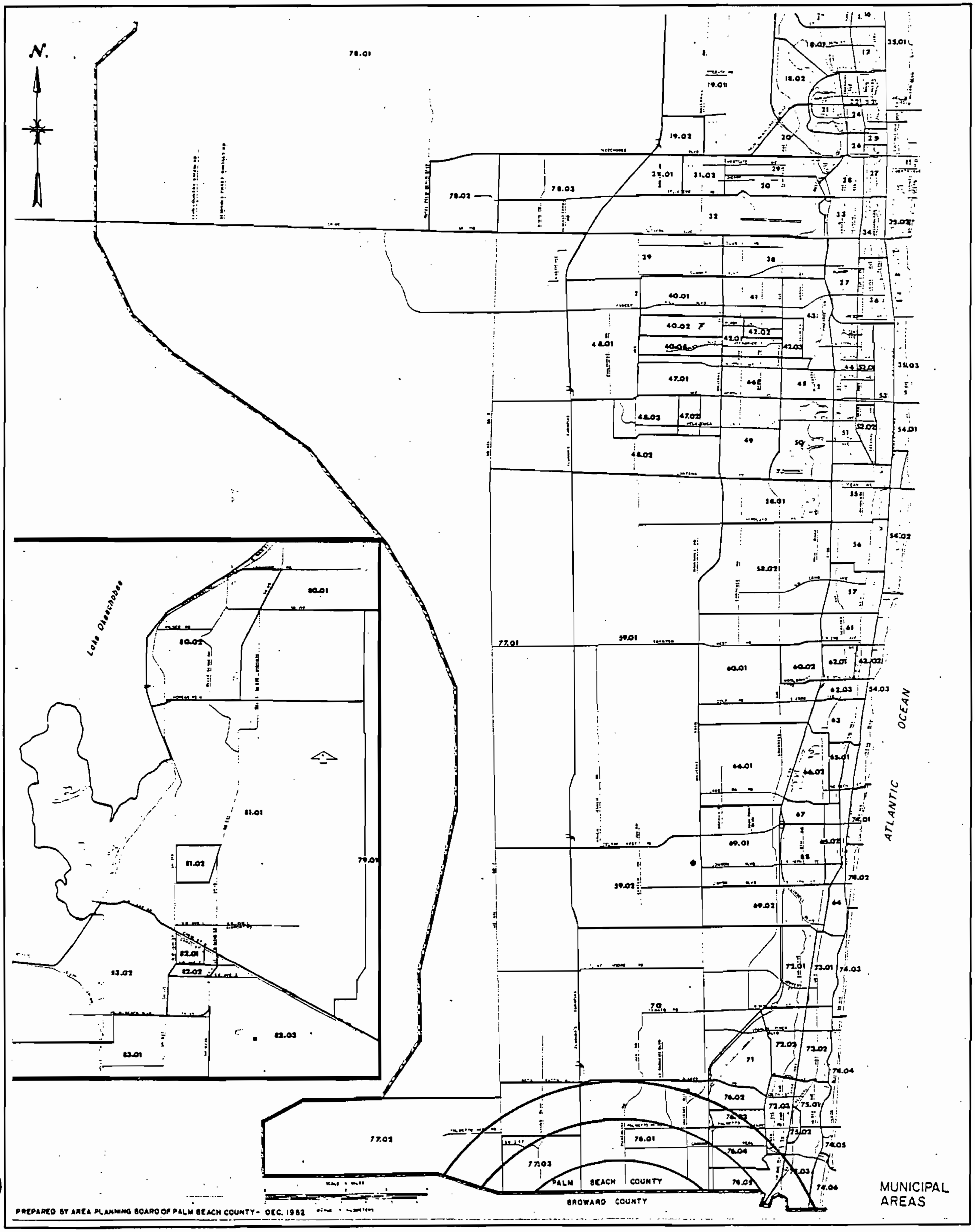
SOURCE: BROWARD COUNTY STATISTICAL SUMMARY 1983.

BROWARD COUNTY

1980 CENSUS TRACTS
FIVE MILE RADIUS AROUND SITE

BEST AVAILABLE COPY

FIGURE 2.2.3.1(A)



PALM BEACH COUNTY
1980 CENSUS TRACTS
FIVE MILE RADIUS AROUND SITE

TABLE 2.2.3.1

SOURCE: U.S. Department of Commerce, Bureau of the Census

Census Tract	April 1 1970	April 1 1980
101	7,749	8,945
102	3,370	6,239
103	6,963	10,785
103.01		4,219
103.02		6,566
104	923	17,390
105	289	1,057
106	391	2,489
107	5,524	10,132
108	5,014	6,031
109	5,222	6,033
110	713	1,554
201	56	2,517
202	7,071	23,912
202.01		6,025
202.02		7,585
202.03		10,302
203	1,626	38,231
203.01		4,362
203.02		3,685
203.03		7,663
203.04		6,771
203.05		4,655
203.06		8,084
203.07		3,011
204	4,502	30,236
204.01		9,081
204.02		17,133
204.03		4,022
205	1,740	10,576
301	4,507	4,413
302	8,373	8,430
303	5,031	8,948
304	7,802	8,206
305	2,693	3,512
306	3,910	5,358
307	1,363	5,690
307.01		3,149
307.02		2,541
308	2,416	6,983
308.01		3,745
308.02		3,238
309	11,122	11,593
310	5,624	6,942
311	5,466	5,703
312	6,324	11,651
312.01		6,087
312.02		5,564
401	3,539	3,876
402	10,535	11,883
402.01		3,618
402.02		8,265
403	4,518	4,756
404	4,169	5,918
405	6,109	8,328
405.01		5,445
405.02		2,883
406	7,182	6,690
407	5,870	6,403
408	7,027	8,433
409	7,159	8,267
410	3,672	3,442
411	4,360	4,845
412	3,885	5,299
413	9,080	9,452
414	4,112	4,860
415	6,102	4,638
416	6,562	7,173
417	3,639	4,479
418	5,983	6,730
419	3,967	3,853
420	3,675	3,903
421	1,725	2,607
422	3,388	3,701
423	5,421	6,148
424	2,926	2,434
425	229	85
426	4,559	5,563
427	5,024	5,713
428	7,162	7,194
429	6,256	5,729
430	9,028	8,502
431	4,459	4,856
432	3,401	3,557
433	7,284	7,403
501	6,009	4,223
502	3,748	8,738
502.01		4,840
502.02		3,898
503	12,639	27,994
503.01		6,249
503.02		9,105
503.03		6,396
503.04		6,244
504	4,719	4,375
505	6,650	7,970
506	7,238	7,385
507	5,645	7,818
508	3,695	5,731
509	6,591	6,738
510	4,405	6,035
601	3,290	41,237
601.01		9,664
601.02		8,194
601.03		14,774
601.04		8,585
602	7,398	29,878
602.01		15,829
602.02		9,229
602.03		4,820
603	2,077	14,345
604	6,591	14,126
605	1,642	9,485
605.01		5,737
605.02		3,748
606	2,981	8,491
606.01		6,380
606.02		2,111
607	3,440	3,305
608	8,249	7,623
609	5,655	5,226
610	1,212	10,227
610.01		6,824
610.02		3,403
611	6,132	6,212
701	5,272	9,068
702	2,562	13,680
703	1,729	12,724
704	2,535	10,973
705	622	4,511
706	1,909	4,455
801	4,677	7,225
802	2,150	1,712
803	1,301	2,583
804	6,094	11,499
804.01		8,992
804.02		2,507
805	6,503	6,104
901	4,054	8,677
902	2,366	2,405
903	6,956	6,851
904	9,625	10,459
905	2,710	10,584
906	7,691	9,280
907	3,712	3,981
908	6,966	8,175
909	6,245	5,659
910	4,906	4,227
911	4,549	5,033
912	10,473	10,007
913	3,979	3,991
914	5,946	5,290
915	4,365	4,458
916	2,192	4,917
917	6,042	5,705
918	7,180	7,183
919	6,317	6,290
920	3,229	2,233
921	---	366
1001	6,214	17,764
1001.01		4,745
1001.02		8,418
1001.03		4,601
1002	4,207	6,296
1003	4,509	5,523
1004	7,158	4,590
1005	4,436	5,449
1006	5,566	5,037
1007	5,128	5,618
1008	4,843	7,272
1101	7,198	6,640
1102	1,611	1,001
1103	7,052	35,358
1104	12,586	13,245
1104.01		9,053
1104.02		4,192
1105	6,488	6,464
Total	620 100	1,018,200

BROWARD COUNTY, 1970 AND 1980

RESIDENT POPULATION BY CENSUS TRACT

Census Tract	Total Population	White	Black	Other	Spanish Origin*	Dwelling Units
74.06	3,169	3,160	1	8	12	2,309
75.01	3,000	2,498	468	34	68	1,425
75.02	21	20	-	1	-	17
75.03	3,086	3,031	40	15	211	1,810
76.01	5,421	5,347	11	63	88	3,796
76.02	3,109	2,952	75	82	98	1,731
76.03	2,675	2,604	14	57	54	896
76.04	6,535	6,471	16	48	142	2,612
76.05	3,455	3,387	19	49	65	1,147
77.01	11,396	10,368	503	525	1,142	6,110
77.02	6,571	6,464	43	64	155	3,917
77.03	5,299	5,255	11	33	118	2,996
78.01	7,773	7,616	59	98	218	2,950
78.02	3,727	3,574	86	67	186	1,823
78.03	2,636	2,538	93	5	30	1,611
79.01	394	181	198	15	19	126
79.02	2,121	60	9	2,052	457	21
80.01	3,845	1,672	2,061	112	277	1,322
80.02	6,057	2,673	3,187	197	783	1,907
81.01	4,870	3,803	615	452	1,378	1,714
81.02	803	258	506	39	74	-
82.01	5,958	811	4,772	375	752	2,410
82.02	3,602	409	3,073	120	273	1,228
82.03	3,044	2,019	807	218	679	928
83.01	2,688	374	2,280	34	54	836
83.02	4,704	1,540	2,921	243	632	1,493
TOTALS	576,813	487,448	77,584	11,781	27,677	286,455

*Included in total population

SOURCE: U.S. Census Bureau, April 1, 1980 (as revised April 1983)
Area Planning Board of Palm Beach County

PALM BEACH COUNTY, 1980

POPULATION, BY RACE AND SPANISH ORIGIN AND DWELLING UNITS BY CENSUS TRACTS

TABLE 2.2.3.2

RESIDENT POPULATION BY MUNICIPALITY ----- 1920 -- 1983

CITY / YEAR (April 1)	1920	1930	1940	1950	1960	1970	1980	1981	1982	1983***
Coconut Creek	----	----	----	----	----	1,359	6,288	8,527	9,816	12,319
Cooper City	----	----	----	----	550	2,535	10,140	11,053	11,526	11,753
Coral Springs	----	----	----	----	----	1,489	37,349	40,849	44,272	46,830
Dania	----	1,674	2,902	4,540	7,065	9,013	11,796	12,151	12,222	12,287
Davie	----	----	----	----	----	5,859	20,515	22,756	30,006	32,502
Deerfield Beach	----	1,483	1,850	2,088	9,573	16,662	39,193	40,138	41,232	41,782
Ferncrest Village*	----	----	----	----	93	1,029	----	----	----	----
Fort Lauderdale	2,065	8,666	17,996	36,328	83,648	139,590	153,279	153,814	153,167	153,185
Hacienda Village****	----	----	----	----	125	35	126	126	128	128
Hallandale	----	1,012	1,827	3,886	10,483	23,849	36,517	36,872	37,413	37,443
Hillsboro Beach	----	----	----	84	437	1,181	1,554	1,562	1,562	1,554
Hollywood	----	2,869	6,239	14,351	35,237	106,873	121,323	121,955	122,680	123,363
Hollywood Ridge Farms**	----	----	----	----	108	302	----	----	----	----
Lauderdale-by-the-Sea	----	----	----	234	1,327	2,879	2,639	2,622	2,628	2,617
Lauderdale Lakes	----	----	----	----	----	10,577	25,426	25,538	26,286	26,376
Lauderhill	----	----	----	----	132	8,465	37,271	37,893	37,997	39,287
Lazy Lake	----	----	----	----	49	48	31	32	31	32
Lighthouse Point	----	----	----	----	2,453	9,071	11,488	11,421	11,474	11,427
Margate	----	----	----	----	2,646	8,867	35,900	37,596	38,388	38,678
Miramar	----	----	----	----	5,485	23,997	32,813	33,332	34,276	34,946
North Lauderdale	----	----	----	----	----	1,213	18,653	19,320	20,006	20,057
Oakland Park	----	463	815	1,295	5,331	16,261	23,035	23,100	23,343	23,537
Parkland	----	----	----	----	----	165	545	658	735	825
Pembroke Park	----	----	----	----	569	2,949	5,326	5,361	6,014	6,036
Pembroke Pines	----	----	----	----	1,429	15,496	35,776	40,070	41,784	42,062
Plantation	----	----	----	----	4,772	23,523	48,653	50,420	51,476	51,650
Pompano Beach	----	----	4,427	5,682	15,992	38,587	52,618	55,911	56,704	57,119
Sea Ranch Lakes	----	----	----	----	170	660	584	584	584	575
Sunrise	----	----	----	----	----	7,403	39,681	42,406	44,022	44,901
Tamarac	----	----	----	----	----	5,078	29,376	30,104	31,158	31,223
Wilton Manors	----	----	----	883	8,257	10,948	12,742	12,658	12,629	12,544
Unincorporated	3,070	3,927	3,738	14,562	138,015	124,137	167,620	164,483	163,485	162,051
Total	5,135	20,094	39,794	83,933	333,946	620,100	1,018,257	1,047,313	1,067,044	1,079,089

*Disincorporated July 1, 1970
**Annexed to Pembroke Park, July 1, 1970
*** Preliminary
SOURCE: U.S. Department of Commerce, Bureau of the Census, 1920-1980
Bureau of Economic and Business Research, University of Florida, 1981-1983

****Annexed to Town of Davie, September 4, 1984

TABLE 2.2.3.2(A)

POPULATION OF BOCA RATON

Year	Population[1]	Change %
1940	723	-
1950	992	37.2%
1960	6,961	1001.0
1970	28,506	310.0
1976	46,079	38.1
1977	47,633	3.4
1978	49,481	3.9
1979	51,622	4.3
1980	53,343	3.3
1981	54,874	2.9
1982	57,001	3.9
1983	58,144	1.0
1984	59,534	2.0

1. Population estimates provided by Community Development Department as of December 31 of each year.

Source: City of Boca Raton Statistical Abstract (Revised April 1985)

Dedication of rights-of-way associated with the Project site will be determined in coordination with the Broward County Office of Planning during the development review process for platting and site planning.

2.2.5 Regional Scenic, Cultural and Natural Landmarks

In addition to the information provided in Section 2.2.1, Governmental Jurisdictions, the following regional scenic, cultural and natural landmarks were identified to exist within 5 miles of the site:

- o Educational Facilities
- o Tourist Attractions
- o Shopping Centers and Malls
- o Airports

The following educational facilities, tourist attractions, shopping malls and airports were identified to exist outside of the one mile radius of the facility but within the five mile radius. No like educational, tourist attractions, shopping malls or airports are located within one mile of the site.

Elementary and Middle Schools

Broward County

Atlantic West Elementary
Bright Horizons School
Coconut Creeks Elementary
Coral Springs Middle School
Cresthaven Elementary
Crystal Lake Middle School
Cypress Elmenetary
Deerfield Beach Elementary
Deerfield Beach Middle School
Deerfield Park Elementary
Drew, Charles Elementary
Forest Hills Elementary
Hunt, James S. Elementary
Margate Elementary
Margate Middle School

MALCOLM PIRNIE

Elementary and Middle Schools (cont'd)

Markham, C. Robert Elementary
Norcrest Elementary
Palmview Elementary
Park Ridge Elementary
Pompano Beach Elementary
Pompano Beach Middle School
Sanders Park Elementary
Tedder Elementary

Palm Beach County

Addison Mizner Elementary School
Verde Elementary School

High Schools

Broward County

Coconut Creek High School
Coral Springs High School
Deerfield Beach High School
Ely High

Palm Beach County

None

Other Educational Facilities

Broward County

Atlantic Vocational Center
Broward County Youth Center
Broward Community College - North Campus

Principal County Tourist Attractions or Shopping Centrs and Malls (within 5 miles)

Broward County

Brown's Miniature Horse Farm
Pompano Park Harness Racing
Goodyear Blimp Base
USA Waterboggan
Pompano Beach Stadium
Hidden Harbor Restaurant and Showboat
Pompano Fishing Fleet
Pompano Fashion Square
Depot Shopping Center

Principal County Tourist Attractions or Shopping Centers and Malls (within 5 miles) (cont'd)

Palm Beach County

Sandalfoot Plaza
Sandalfoot Square
Village Pointe Shopping Center
Wharfside at Boca Pointe
Gardens Shops at Boca
Del Mar Shopping Village
Shops at Boca
Palmetto Park Square

Airports

Broward County

Pompano Beach Airport

Palm Beach County

None

None of these areas of cultural interest will be affected by the proposed plant or its emissions.

2.2.6 Archaeological and Historic Sites

The State of Florida, Division of Archives, History and Records Management, reviewed a map of the area for evaluation of known or potential historic or archaeological resources at the site. The results of this review indicate that the probability of any significant occurrence of historic or archaeological resources is very low. Therefore, no further investigation is required prior to construction. Appendix 10.16 provides further details on this issue.

2.2.7 Socioeconomics and Public Services

2.2.7.1 Social and Economic Characteristics

Current Population. In 1980, total Broward County population as recorded by the U.S. Bureau of Labor, Department of Census was 1,018,200 and for Palm Beach County it was 576,863. It is anticipated that approximately 40 percent of the total Broward County population will be serviced by the Northern

Resource Recovery Facility. Previous Figures 2.2.3.1 and 2.2.3.1(A) detail the 1980 census population counts for those census tracts partially or wholly located within five miles of the site. The site is located in Broward County census tract 104. In 1980 the population of census tract 104 was 17,390. In aggregate, 1980 census populations for all Broward census tracts located within 5 miles of the site was 202,412 and for all Palm Beach census tracts located within 5 miles of the site was 36,151.

Labor Force. The civilian labor force in Broward County as a whole totaled 370,100 in 1983. This represents a 5 percent increase since 1980. The unadjusted unemployment rate in January of 1983 was 9.1 percent. In July of 1984 the unemployment rate had fallen to 5.4 percent. This compares to national unadjusted unemployment rate figures for the same period of 11.4 percent and 7.5 percent, respectively. Table 2.2.7.1 presents a compilation of unemployment data from January 1982 through August of 1984.

The civilian labor force in Palm Beach County as a whole totaled 324,313 in 1984 which is a 40 percent increase since 1980. The unemployment annual rate in 1984 was 6.4 percent compared to a national annual rate of 7.5 percent. Table 2.2.7.2 presents unemployment data from 1970 through 1980 and for 1984.

Employment by Occupation in the Industrial Sector. Table 2.2.7.3 presents 1983 employment statistics by occupation (except agriculture) for Broward County. Table 2.2.7.4 presents 1984 employment statistics by occupation (except agriculture) for Palm Beach County.

General Income Characteristics. Within the 5 mile radius of the proposed Hilton Road site there is a combination of high and low median household incomes. The City of Parkland contains a majority of the upper income households. The City of Deerfield Beach contains a majority of the lower income

TABLE 2.2.7.1

UNEMPLOYMENT RATE (UNADJUSTED)
BROWARD COUNTY, STATE OF FLORIDA, UNITED STATES
JANUARY 1982-JUNE 1983

Year	Month	Broward	Florida	United States
1982	January	6.0%	7.7%	9.4%
	February	5.7	7.1	9.6
	March	7.0	8.6	9.5
	April	6.4	7.9	9.2
	May	6.0	7.3	9.1
	June	6.1	7.7	9.8
	July	5.8	7.5	9.8
	August	6.2	7.8	9.6
	September	6.7	8.2	9.7
	October	7.6	9.2	9.9
	November	8.0	9.5	10.4
	December	7.8	9.5	10.5
	Annual Average	6.6	8.2	9.7
1983	January	9.1	10.4	11.4
	February	8.3	9.5	11.3
	March	7.6	8.9	10.8
	April	7.3	8.4	10.0
	May	7.7	8.7	9.8
	June	7.6*	8.8	10.2
	July	6.7	8.2	9.4
	August	6.7	8.2	9.2
	September	6.4	8.1	8.8
	October	7.0	8.6	8.4
	November	6.6	8.1	8.1
	December	6.1	7.5	8.0
1984	January	6.1	7.4	8.8
	February	4.9	6.1	8.4
	March	4.3	5.4	8.1
	April	4.6	5.7	7.6
	May	5.0	6.1	7.2
	June	5.3	6.6	7.4
	July	5.4	6.8	7.5
	August	4.7*	6.2*	7.3
	September	N/A	N/A	7.1

*Preliminary

Source: State of Florida, Department of Labor and Employment Security, Bureau of Labor Statistics

TABLE 2.2.7.2

LABOR FORCES ESTIMATES
PALM BEACH COUNTY, FLORIDA, AND UNITED STATES

	Palm Beach County					
Year	Civilian Labor Force	Employed	Unemployed	Unemployment Rate	Florida Unemployment Rate	United States Unemployment Rate
1970	141,693	138,141	3,552	2.5	4.3	4.9
1971	146,325	139,736	6,589	4.5	4.9	5.9
1972	155,215	145,382	9,633	6.2	5.1	5.6
1973	167,284	161,617	5,667	3.4	4.3	4.9
1974	181,480	171,710	9,770	5.4	6.2	5.6
1975	187,523	167,338	20,185	10.8	10.7	8.5
1976	192,453	172,335	20,118	10.5	9.0	7.7
1977	195,320	174,849	20,471	10.5	8.2	7.0
1978	206,288	193,345	12,943	6.3	6.3	6.2
1979	222,500	207,200	14,600	6.6	6.1	5.8
1980	232,500	218,800	13,700	5.9	5.9	7.2
1984	324,313	303,512	20,801	6.4	-	7.5

Source: Florida Department of Labor and Employment Security, Division of Employment Security.

TABLE 2.2.7.3

AVERAGE ANNUAL NON-AGRICULTURAL EMPLOYMENT
BY INDUSTRY DIVISION
BROWARD COUNTY, 1983

Industry	Employment Number	Employment Percent
Construction	25,900	7.0
Manufacturing	41,600	11.2
Durables	31,300	8.4
Non-Durables	10,300	2.8
Transportation, Public Utilities	18,100	4.9
Trade	107,800	29.1
Retail	88,900	24.0
Wholesale	18,900	5.1
Finance, Insurance, Real Estate	33,200	9.0
Services and Miscellaneous	94,200	25.5
Government	49,300	13.3
Total	370,100	100.0%

Source: Florida Department of Labor and Employment Security

TABLE 2.2.7.4

EMPLOYMENT DISTRIBUTION BY INDUSTRY
PALM BEACH COUNTY

Industry	1984
Manufacturing	34,500
Contract Construction	24,900
Transportation	10,500
Trade	69,800
Finance	20,900
Services	72,500
Government	33,200
TOTAL	266,300

Source: Florida Department of Commerce.

MALCOLM PIRNIE

households. Median household income for residences within a one mile radius of the proposed site falls within the lower fifty percentile of Broward County averages.

Source of Income. Throughout the nine cities in the area, the primary source of income is wages and salary. Approximately 50 percent of the land in the area is used for light to medium residential housing (see Figures 2.2.2.1 and 2.2.2.1(A).

Average Wage and Salary Income. For those census tracts either partially or wholly within five miles of the site, private services account for the primary source of income. Private services provided more jobs in 1983 for this area than any other industrial sector in Broward County or Palm Beach County.

Existing Housing Stock. Housing statistics are shown in Table 2.2.7.5. Parkland has the greatest proportion of owner-occupied housing units (87%), while the Pompano Beach has the lowest (51%).

Building Activity. Multi-family housing units represented the largest proportion of building activity in Broward County between 1970 and 1982. Single family housing units represented the largest proportion of building activity in Palm Beach County between 1975-1984. Table 2.2.7.6 presents municipality building activities based on building permits issued to build within five miles of the proposed site. Table 2.2.7.7 and Figure 2.2.7.1 presents information pertaining to residential building permits issued for Broward County and Palm Beach County, respectively.

Housing Costs. Of those census tracts partially or wholly within the 5 mile radius of the site, average median housing value is highest in Parkland. Median housing values and condominium values for the same area are shown in Table 2.2.7.8.

TABLE 2.2.7.5

EXISTING HOUSING INFORMATION, 1980

Municipality	Total Housing	Occupied Year Round Housing Units: Total	Owner Occupied	Renter Occupied	Vacant Year-Round Housing Units: Total	For Sale	For Rent	Other
Broward County								
Coconut Creek	3,509	2,820	2,543	277	689	123	62	504
Pompano Beach	32,262	24,244	16,604	7,640	8,018	369	920	6,729
Lighthouse Point	5,674	5,097	4,397	700	577	61	54	462
Deerfield Beach	21,071	18,422	14,631	3,791	2,649	232	450	1,967
Park Land	176	162	153	9	14	-	1	13
Coral Springs	12,746	11,392	8,469	2,923	1,354	533	264	557
Margate	16,632	14,639	12,802	1,837	1,993	156	134	1,703
Hillsboro Beach	1,464	875	778	97	589	38	34	517
Palm Beach County								
Boca Raton	25,833							

MALCOLM PIRNIE

TABLE 2.2.7.6

RESIDENTIAL BUILDING PERMITS ISSUED, BY MUNICIPALITY,
BROWARD COUNTY, 1983 AND 1970-1983

Municipality	1983				1970-1982			
	Single Family	Duplex	Multi-Family	Total	Single Family	Duplex	Multi-Family	Total
Broward County								
Coconut Creek	12	-	179	191	840	78	4,649	5,567
Pompano Beach	27	8	110	145	816	390	16,232	17,438
Lighthouse Point	-	-	-	-	-	-	-	-
Deerfield Beach	51	4	249	304	2,668	272	14,322	17,262
Parkland	13	-	-	13	153	-	-	153
Coral Springs	393	30	957	1,380	7,893	1,116	7,832	16,931
Margate	62	4	101	167	5,204	230	9,250	14,684
Hillsboro Beach	-	-	30	30	110	-	930	1,040
	1984				1975-1984			
Palm Beach County								
Boca Raton	466	-	251	717	4,151	-	2,685	6,836

TABLE 2.2.7.7

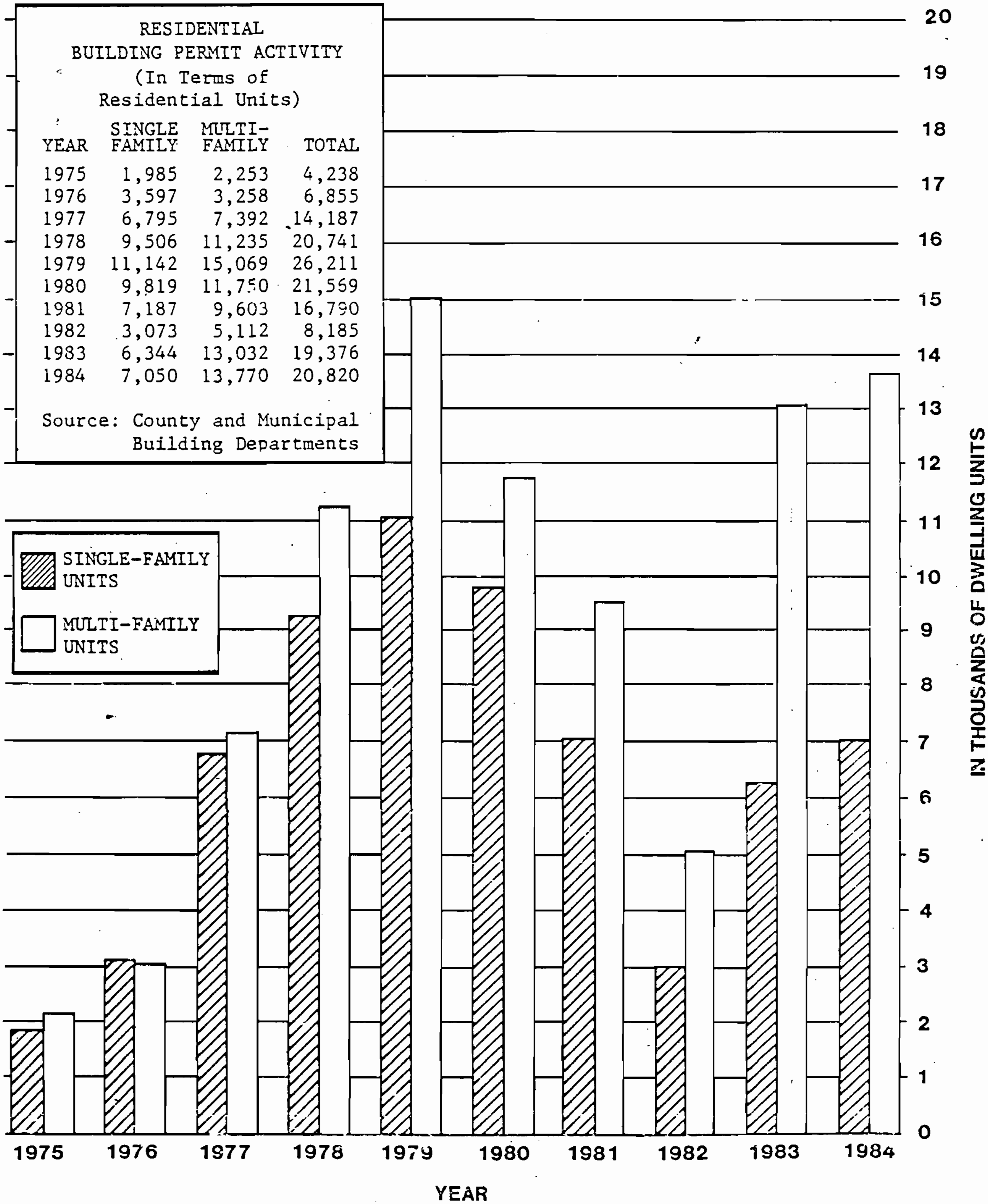
RESIDENTIAL BUILDING PERMITS ISSUED
BROWARD COUNTY, 1970 - AUGUST, 1984

	Single Family		Duplex		Multi-Family		Total	
Year	Number	%	Number	%	Number	%	Number	%
1970	6,200	30.7	1,096	5.4	12,924	63.9	20,200	100.0
1971	7,999	27.3	1,274	4.4	20,014	68.3	29,287	100.0
1972	9,664	21.3	1,544	3.4	34,090	75.3	45,298	100.0
1973	11,071	16.9	1,496	2.3	52,981	80.8	65,548	100.0
1974	3,585	17.5	602	2.9	16,367	79.6	20,554	100.0
1975	3,334	63.4	396	7.5	1,532	29.1	5,262	100.0
1976	4,871	59.9	458	5.6	2,803	34.5	8,132	100.0
1977	6,951	49.8	392	2.8	6,613	47.4	13,956	100.0
1978	8,143	35.9	464	2.0	14,078	62.1	22,685	100.0
1979	6,304	39.4	444	2.8	9,247	57.8	15,995	100.0
1980	5,078	32.8	499	3.2	9,920	64.0	15,497	100.0
1981	2,987	34.3	431	5.0	5,279	60.7	8,697	100.0
1982	1,828	28.4	272	4.2	4,334	67.4	6.434	100.0
1983	4,696	33.0	476	3.4	9,042	63.6	14,214	100.0
1984*	3,647	32.9	346	3.1	7,089	64.0	11,082	100.0

*Through August

Source: Fort Lauderdale News/Sun Sentinel

MALCOLM PIRNIE



RESIDENTIAL
BUILDING PERMIT ACTIVITY
(In Terms of
Residential Units)

YEAR	SINGLE FAMILY	MULTI-FAMILY	TOTAL
1975	1,985	2,253	4,238
1976	3,597	3,258	6,855
1977	6,795	7,392	14,187
1978	9,506	11,235	20,741
1979	11,142	15,069	26,211
1980	9,819	11,750	21,569
1981	7,187	9,603	16,790
1982	3,073	5,112	8,185
1983	6,344	13,032	19,376
1984	7,050	13,770	20,820

Source: County and Municipal Building Departments

BROWARD COUNTY

RESIDENTIAL BUILDING PERMIT ACTIVITY

TABLE 2.2.7.8

AVERAGE VALUE OF OWNER-OCCUPIED UNITS
NON-CONDOMINIUM AND CONDOMINIUM

Municipality	Non-Condo	Condo
Broward County		
Coconut Creek	$ 78,690	$59,591
Pompano Beach	83,045	77,308
Lighthouse Point	123,165	53,151
Deerfield Beach	69,507	46,645
Parkland	163,590	--
Coral Springs	112,162	52,606
Margate	60,095	45,466
Hillsboro Beach	178,723	95,635

2.2.7.2 Area Public Service and Utilities

Education. An extensive list of schools is provided in Section 2.2.5.

Transportation. Section 5-9 discusses the average daily traffic volumes and concludes that there would be an insignificant impact on existing traffic conditions.

Medical Facilities. A list of medical facilities within a 5 mile radius of the proposed facility is provided in Section 2.2.1.

Fire Fighting Facilities. On-site fire fighting facilities would consist of the following:

- The fire protection system will be designed to detect, suppress and prevent fires from spreading so that a fire does not cause excessive damage to Plant equipment and structures. The fire water system will supply an adequate quantity of water for fire fighting to the yard hydrants, water spray systems and sprinkler systems.

- Firewater to the site will be supplied from the 16-inch water line adjacent to Powerline Road. The power block portion of the Plant shall be ringed by a 10-inch main fire loop supplying the automatic fire suppression systems, yard hydrants, standpipes and hose reels. This loop shall be provided with post indicator valves as required by National Fire Protection Association (NFPA).

- The transformer area will be protected by a dry pipe fixed spray system. The cable spreading area under the control room floor will be protected by a Halon system. Water cannons are provided at the perimeter of the refuse pit. Standpipes and hose racks are also provided for these areas as well as other plant areas in accordance with NFPA criteria.

- Fire protection system supervisory instrumentation and annunciators will be located in the main control room. System components are designed in accordance with the established by the National Fire Protection Association.

    1. The underground fire main yard loop, fire hydrants, the distribution of fire hydrants, the distribution of fire hydrants and their installation will comply with the requirements of NFPA 24.

2. The water spray systems will be designed and installed in accordance with the requirements of NFPA 13 and 15.

3. Portable fire extinguishers will be selected based on the specific area fire hazard and distributed in accordance with the requirements of NFPA 10.

4. The fire detection systems will be designed and installed in accordance with NFPA 72C and 72E.

The following is a list of Fire Stations located in the immediate area of the proposed resource recovery facility:

Coconut Creek Volunteer F.D., 1071 NW 45 Ave., Coconut Creek
Collier City Volunteer F.D., 9050 SW Pl., Cooper City
Deerfield Beach, Station No. 1, 928 E. Hillsboro Blvd. (City Emergency Medical Service Unit) (responding unit)
Rockland Volunteer F.D., 7400 Holmberg Rd., Parkland
Pompano Beach, Station No. 5, 2001 NW 3 Ave.

Police Protection. The following is a list of Police Departments in Broward County:

Broward County Sheriff's Office/201 SE 6th St. (responding unit)
Coconut Creek/1071 NW 45 Ave. (located near the site)
Cooper City/9090 SW 50 Pl/11610 Stonebridge Pky
Coral Springs/106 W. Dania Bch Blvd.
Davie/6591 SW 45 St.
Deerfield Beach/300 NE 2 St.
Fort Lauderdale/1300 W. Broward Blvd.
Hallandale/100 SW 4 Ct.
Hillsboro Beach/1210 A 1-A Hyw.
Lauderdale-by-the-Sea/4501 Ocean Dr.
Lauderdale Lakes/3461 NW 43 Ave.
Lauderhill/1980 NW Ave.
Lazy Lake/2154 Lazy Lane
Lighthouse Point/3760 NE 22 Ave.
Margate/5790 Margate Blvd.
Miramar/6700 Miramar Pky.
North Lauderdale/1051 SW 80 Ave.
Oakland Park/3650 NE 12 Ave.
Parkland/6500 Parkside Dr. (located near the site)
Pembroke Pines/3150 SW 52 Ave.
Pembroke Pines/9500 W. Pines Blvd.
Plantation/7051 NW 4 St.
Pompano Beach/101 SW 1 Ave.
Sea Rank Lakes/1 Gatehouse Rd.
Sunrise/1277 Sunset Strip

Tamarac/5811 NW 88 Ave.
Wilton Manors/524 NE 21 Ct.

Recreation Facilities. A list of recreation facilities is provided in Section 2.2.5.

Electricity. Will be generated on-site by a condensing turbine generating set. All electrical utility power not used by the plant will be sold to Florida Power and Light. Backup emergency power will be supplied by Florida Power and Light.

Gas. Natural gas will not be used in the RRF. Back-up emergency power will be supplied by Florida Power and Light.

Water Supply Facilities. A 16 inch diameter water transmission line will provide potable water and boiler make-up requirements for the Resource Recovery Facility. An 8-inch diameter transmission line will supply secondary treated wastewater to the Facility for cooling.

Sewage Treatment Facilities. Discharges from the Resource Recovery Facility will flow to an existing 36-inch sanitary sewer line located directly adjacent to Powerline Road. All discharges will go to the Broward County North Regional Wastewater Treatment Plant for treatment prior to ocean discharge.

Solid Waste Disposal. Refuse generated on-site will be processed at the facility. No hazardous material will be generated on-site. Any unprocessable waste (i.e. oversized or bulky waste) that cannot be incinerated will be landfilled directly at the adjacent landfill.

2.3 Biophysical Environment

2.3.1 Hydrogeology

The following subsections describe the major geologic features of the site and associated facility areas. This information includes the results of the geotechnical studies which were undertaken to determine the structural and environmental suitability of the site. The study description includes identification and justification of the sampling pattern, sampling method, and analytic techniques.

Because the facility will not incorporate an ash residue/unprocessable waste landfill, a detailed description of site-specific hydrogeologic characteristics will not be required. However, regional aquifer and surface water characteristics are discussed in order to assist in defining a surface water management plan which will conform with South Florida Water Management District (SFWMD) requirements.

2.3.1.1 Geologic Description of the Site Area

The most common geologic formations in Broward County to a depth of approximately 300-400 feet, are limestones overlain by sand. These units are Pleistocene to Late Miocene (from 1 million to 25 million years old).

The Biscayne Aquifer system, the major potable water source for south Florida, with the exception of certain coastal areas where salt water intrusion has occurred, underlies all of eastern Broward County. This system is comprised of highly permeable limestones and sandstones with overlying younger deposits of sand. The Biscayne Aquifer extends from land surface to a depth of more than 200 feet along the coast, thins westward to a depth of about 70 feet in central Broward County, and pinches out near the western county line. At various locations, it may be composed of: the upper part of the Tamiami formation, small erosional remnants of the Caloosahatches marl, the Anastasia formation, the Fort Thompson formation, the Miami oolite, and the Pamlico sand. The aquifer grades into a predominantly sandy phase in the Fort Lauderdale area. Wells often must be cased to the main water horizon, and screens may be required to prevent sand from entering the well. It is underlain by a thick sequence of relatively impermeable clayey materials which in turn overlie the permeable limestone formations of the Floridan Aquifer. The confined Floridan Aquifer extends from a depth of about

900 feet to more than 3,000 feet and is overlain by a 500 to 600-foot section of clay, silt, and marl of low permeability. Parker, et al. (1955), presents a comprehensive description of the geology of southeastern Florida.

The typical lithology in the area is shown by the log of USGS well G515 (Table 2.3.1.1), and the logs depicted in Figures 2.3.1.1, 2.3.1.2, and 2.3.1.3. The lithologic and permeability description in Table 2.3.1.1 are an interpretation of the USGS and show that low and high permeabilities are generally associated with sand and rock zones, respectively. Although the lithology is highly variable, Figure 2.3.1.1 shows that about 60 feet of low permeability sand overlie at least 140 feet of highly permeable limestone interbedded with sandstone and sand. In some areas, the deposits below a depth of 60 feet are predominantly sand or sandstone and sand. The wells depicted in Figure 2.3.1.1 are located on Figure 2.3.1.4.

There is also evidence of a low-permeability zone at the base of the Biscayne Aquifer. Many of the wells in Figures 2.3.1.1., 2.3.1.2 and 2.3.1.3 show the presence of sand or marl beds at depths below 180 feet, and the lithologic interpretation of Table 2.3.1.1 associates similar beds with low to very low permeabilities. The presence of brackish water near the base of the aquifer (Vorhis, 1948) suggests that a low-permeability zone may have entrapped connate water or relict seawater by retarding ground water movement.

In general, the geologic units underlying the Hilton Road site are comprised of up to 100 feet of unconsolidated sands which in turn are underlain by as much as 200 to 300 feet of interbedded limestone, sandstone, sand and clay/marl. Figure 2.3.1.5 provides a geologic cross section a few miles south of the site. As noted on the figure, lithologic conditions are highly variable within the Biscayne Aquifer.

2.3.1.2 <u>Detailed Site Lithologic Description</u>

Information contained in this section has been developed from exploratory borings taken as part of the site selection

TABLE 2.3.1.1

TYPICAL LITHOLOGY - USGS WELL G515[1]

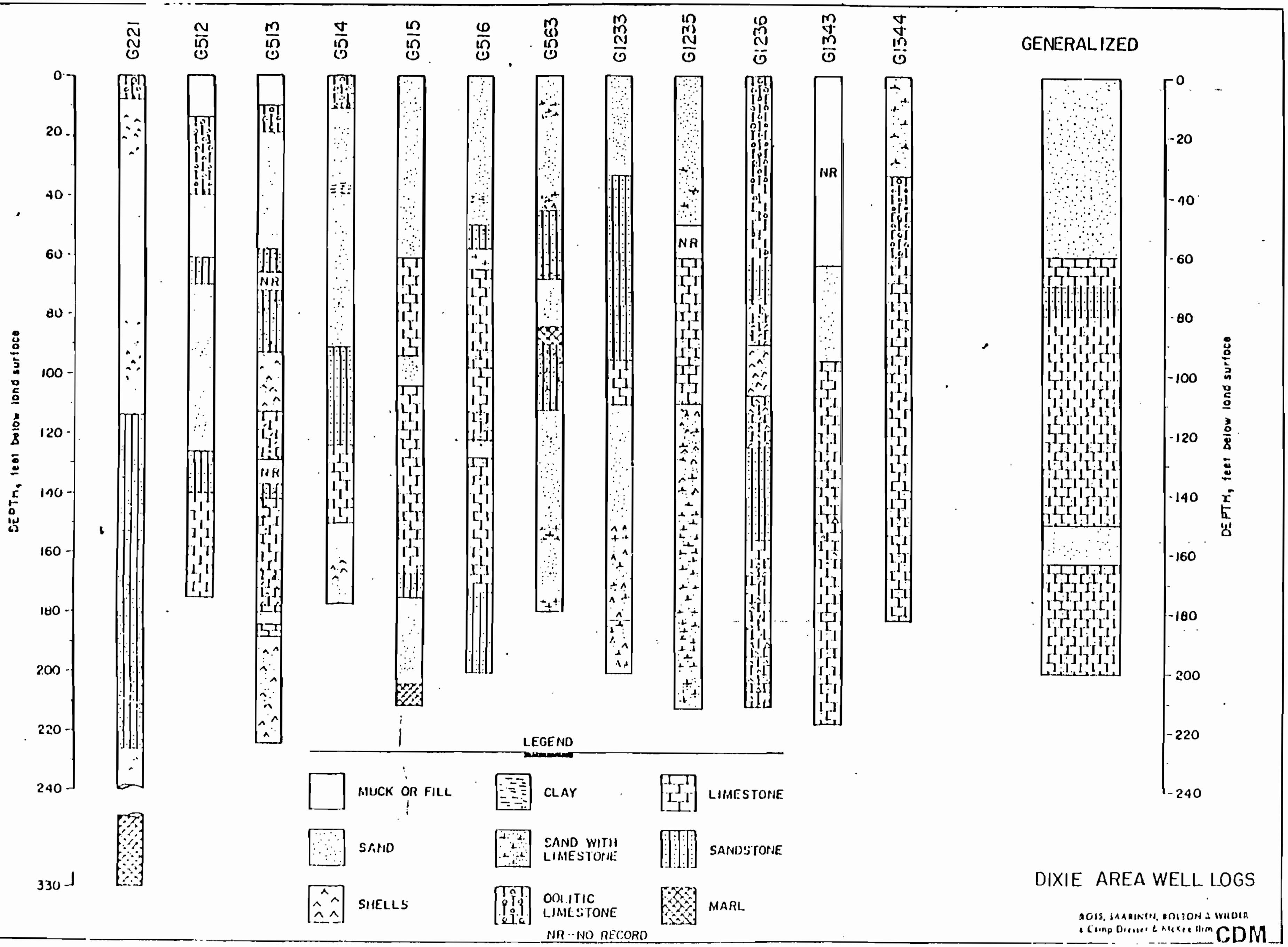
Location: N.E. 1/4 S.W. 1/2 Section 12, T. 50 S., R. 41E., in center of Fort Lauderdale Golf and Country Club, near City Well 6.

Elevation of land surface: about 9.0 feet above mean sea level.

	Depth in feet below land surface
Sand, quartz, grayish-white.	0 - 3
Sand, quartz, dark-brown, medium-grained, containing a large amount of organic material. Moderately permeable.	3 - 31
Sand, quartz, fine-grained.	31 - 42
Sand, quartz, very fine-grained with some admixed clay. Low permeability.	42 - 61
Limestone, sandy, cavernous, with some quartz sand. Limestone has weathered appearance. Moderately permeable.	61 - 68
Limestone, sandy, and quartz sand. Each have peppered appearance due to presence of collophane. Medium to low permeability.	68 - 94
Sand, quartz, very fine-grained, peppered with collophane and ilmenite. Low permeability.	94 - 104
Limestone, sandy, and calcareous sandstone, fossiliferous. Very permeable between 107 and 123 feet; low, between 123 and 167 feet.	104 - 167
Sandstone, calcareous. Permeable.	167 - 175
Sand, quartz, interbedded with thin layers of clay. Low permeability.	175 - 204
Marl, clayey, gray-green with thin lenses of quartz sand containing some ilmenite. Very low permeability.	204 - 211

Note:
1. As interpreted by the United States Geological Survey.

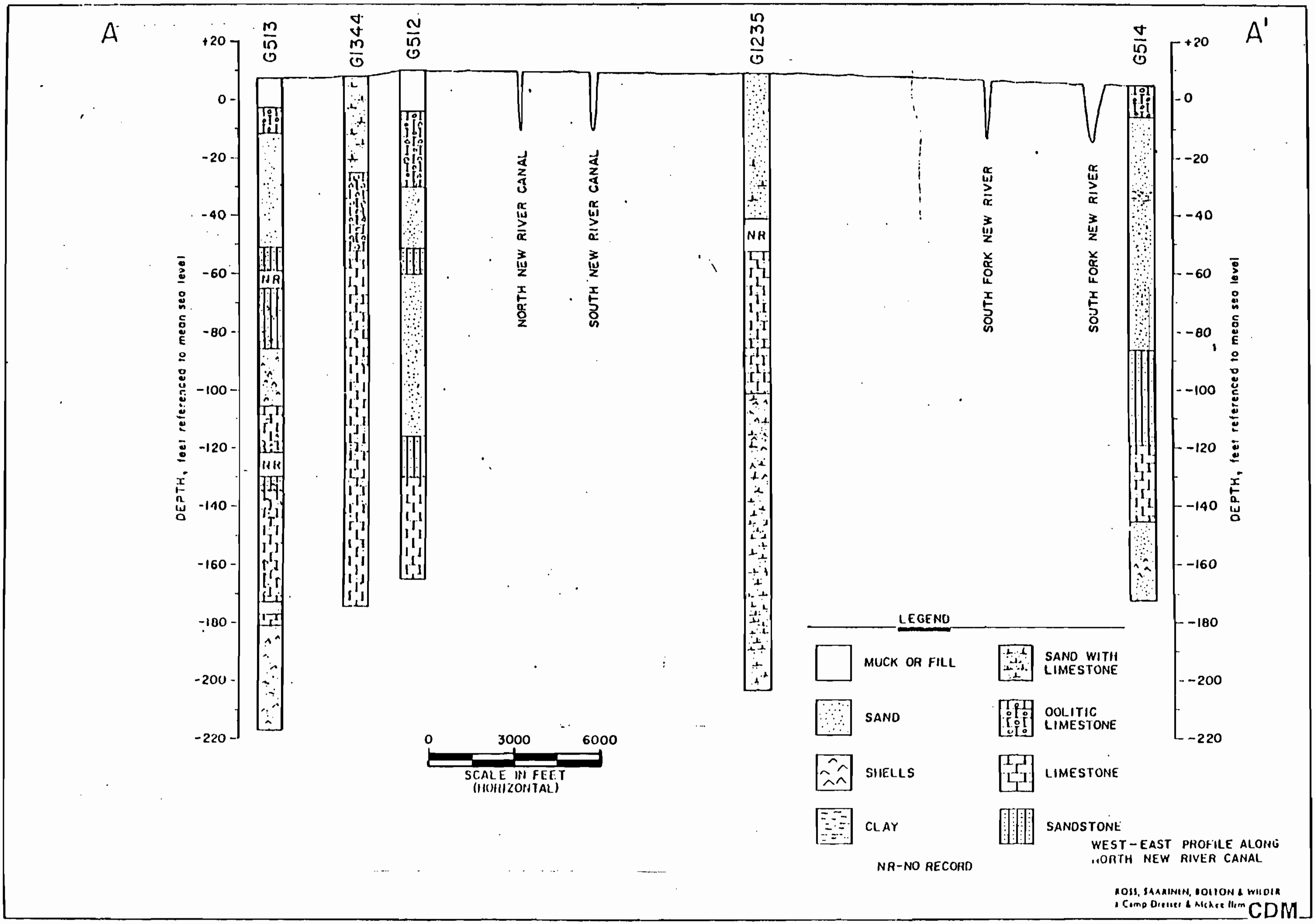
FIGURE 2.3.1.1



DIXIE AREA WELL LOGS

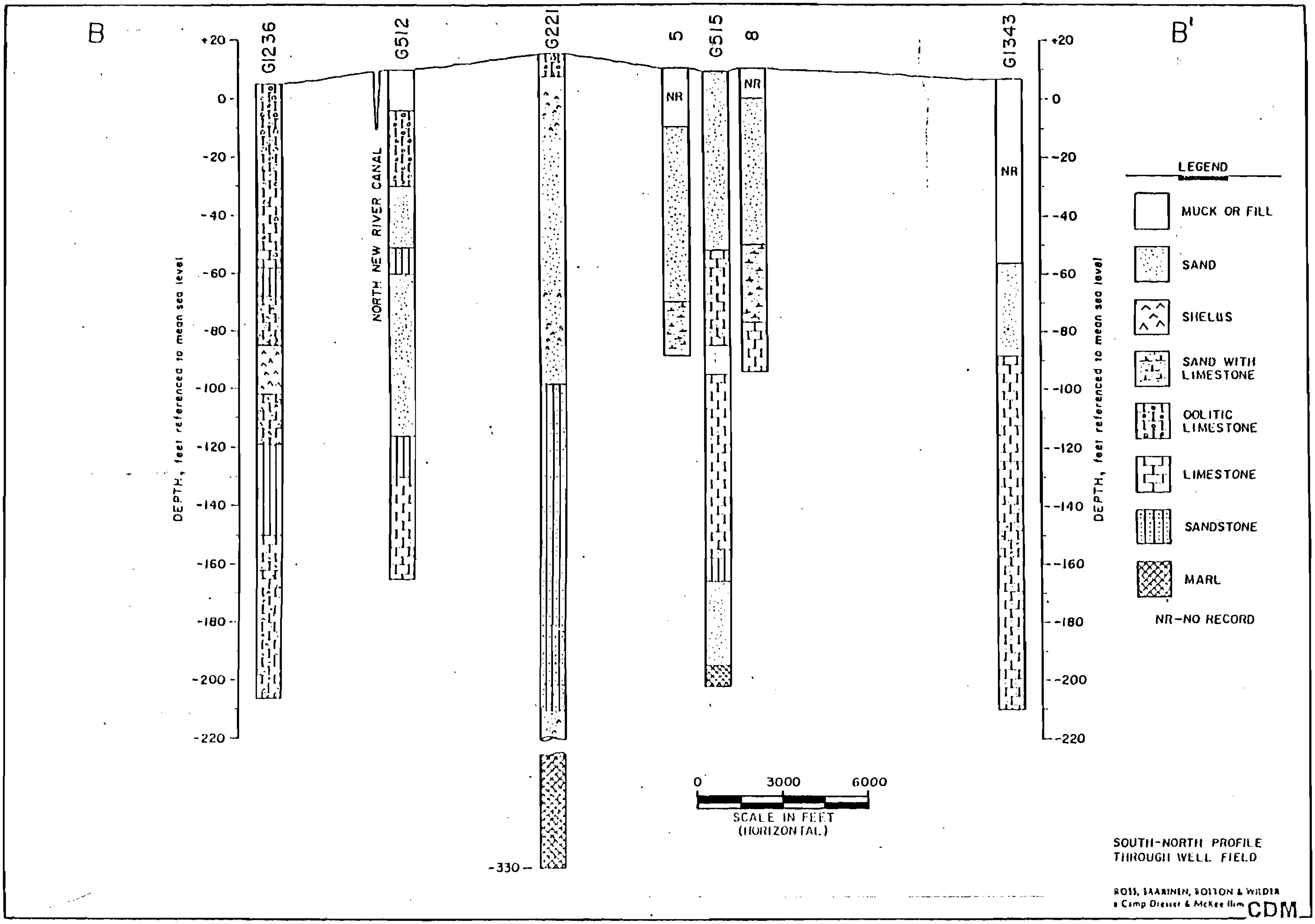
ROSS, SAARINEN, BOLTON & WILDER
a Camp Dresser & McKee firm
CDM

FIGURE 2.3.1.2



Note: See Figure 2.3.1.4 for Line of Section

FIGURE 2.3.1.3



Note: See Figure 2.3.1.4 for Line of Section

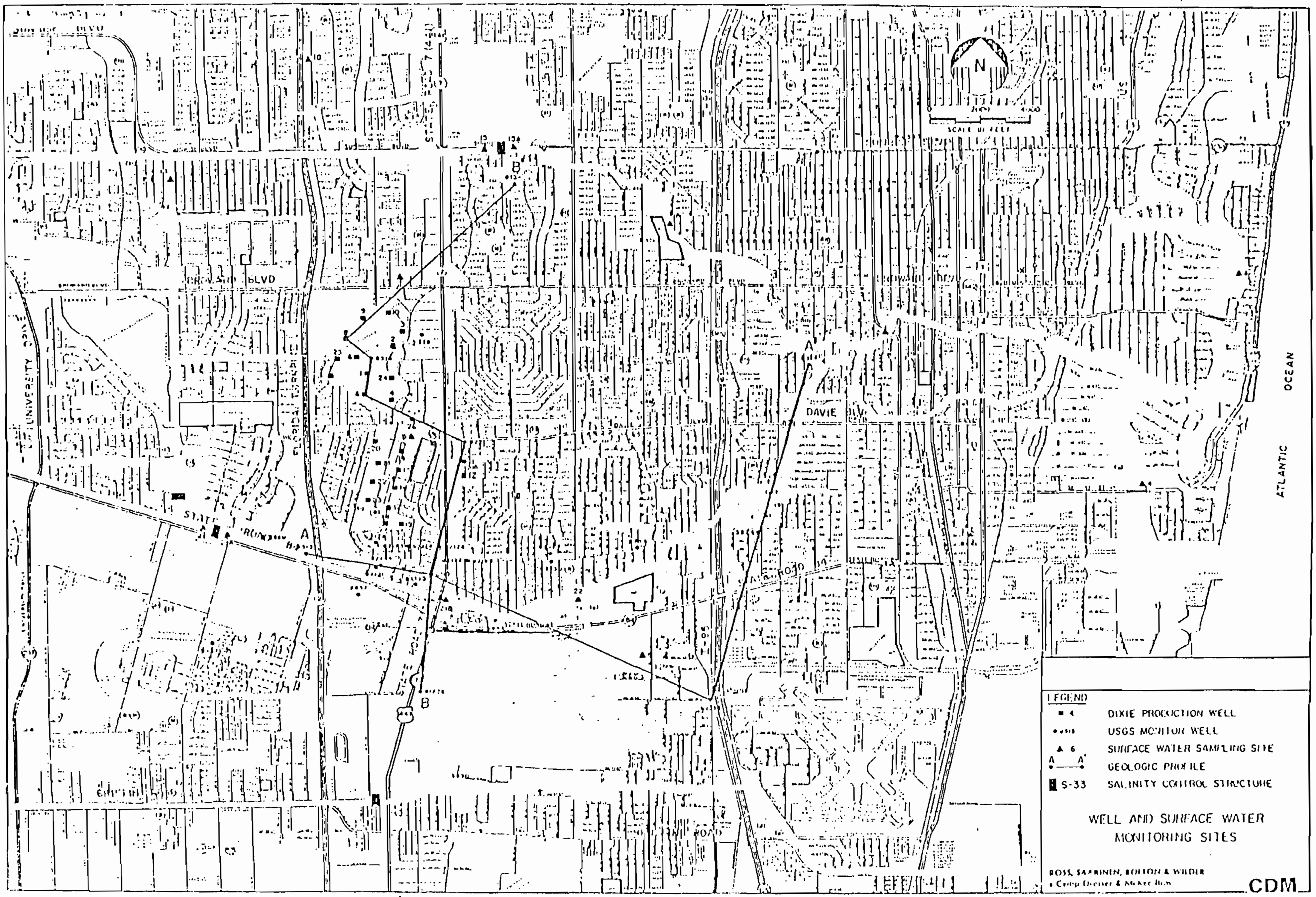
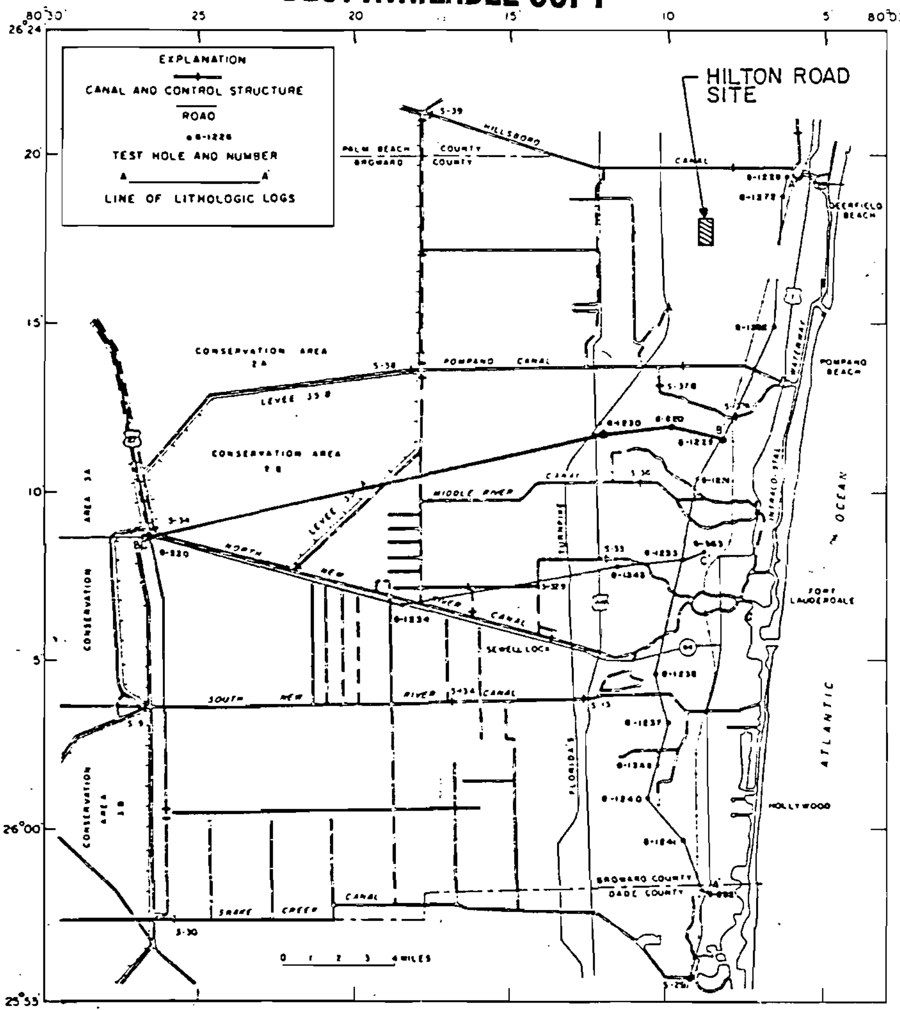


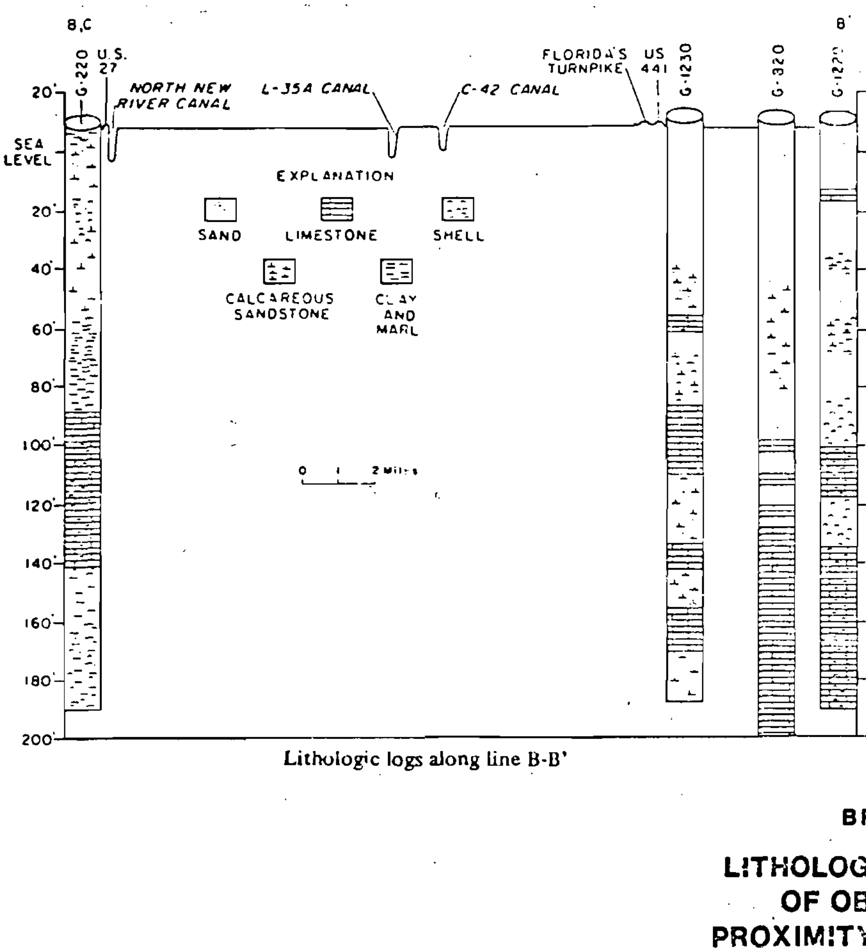
FIGURE 2.3.1.4

Note: Cross Sections Shown on Figures 2.3.1.2 and 2.3.1.3

FIGURE 2.3.1.5



Location of test holes and lines of lithologic logs in eastern Broward County.



Lithologic logs along line B-B'

BROWARD COUNTY

LITHOLOGIC LOGS AND LOCATIONS OF OBSERVATION WELLS IN PROXIMITY TO HILTON ROAD SITE and geotechnical investigation efforts of Broward County's Resource Recovery Program. Florida Testing and Engineering Company under supervision of Reynolds, Smith and Hills, conducted a geotechnical investigation, in September 1985, involving 15 borings on the site and an area 400 ft. east of the eastern property boundary. The borings range 30 to 100 feet in depth.

Site Soils

Information on existing soils at the northern site was obtained from the Broward County Soil Survey (U.S.D.A. Soil Conservation Service, 1976) and verified by geotechnical investigations to provide additional background soil and geologic data.

The site is entirely on Hallandale and Margate soils (Hm). These soils are level, poorly drained and have been graded and covered with generally 8 to 20 inches of fill material (sand, shell and limestone fragments). Other soil types and pond bottoms may occasionally underlie the fill material which may be as deep as five feet or more.

The soil borings indicate fill material (limestone, silt and debris) can be found at depths as great as 35 feet. Some silty material is tentatively identified as buried sludge. The remaining material found in borings is fine to medium sand.

Site Stratigraphy

The adjacent and on-site boring logs in Appendix 10.8 indicate fine to medium sand to a depth of at least 85 feet except for the near surface fill material described above. Boring B-5 (100 feet deep) in the center of the site is the only boring exceeding a depth of 75 feet. Some limestone is found in the geologic samples beginning at 85 feet. These findings corroborate earlier investigations conducted about two miles to the south (Law Engineering Testing Company, 1980; Malcolm Pirnie, 1983).

A layer of sandy marl at Boring B-6 (37 feet to 40 feet [boring bottom]) and B-9 (38 feet to 43 feet) may be locally confining, however, it is not areally extensive enough to be significant.

2.3.1.3 Geologic Maps

The site has generally uniform geologic conditions, typical of the Broward County area.

The borings indicate fine to medium sand with discontinuous fill materials near the surface and an occasional discontinous layer of marl at depth. Limestone content appears to increase below 85 feet. The closest confining layer would be the layer below the Biscayne Aquifer, which consists of marl and lime clay. Above that ground water is unconfined.

2.3.1.4 Bearing Strength

In the Subsoil Investigation Report in Appendix 10.8, a range in soil loading values from 1,000 to 4,000 pounds per square foot have been calculated. Because of nonuniformity caused by variation in depth of debris deep piling is recommended, in the above report, for most aspects of construction.

2.3.2 Subsurface Hydrology

This section contains two subsections which describe the physical, chemical, and hydrological characteristics of subsurface waters. These have the potential to be affected by the construction or operation of the proposed plant, and associated facilities. Even though facility construction and operations may not have any effect on ground water, the environmentally sensitive nature of the Biscayne Aquifer (i.e. unconfined aquifer with high horizontal and vertical hydraulic conductivities, and it being the sole potable ground water supply in Broward County) has made the performance of a detailed aquifer analyses an important factor for proper facility design.

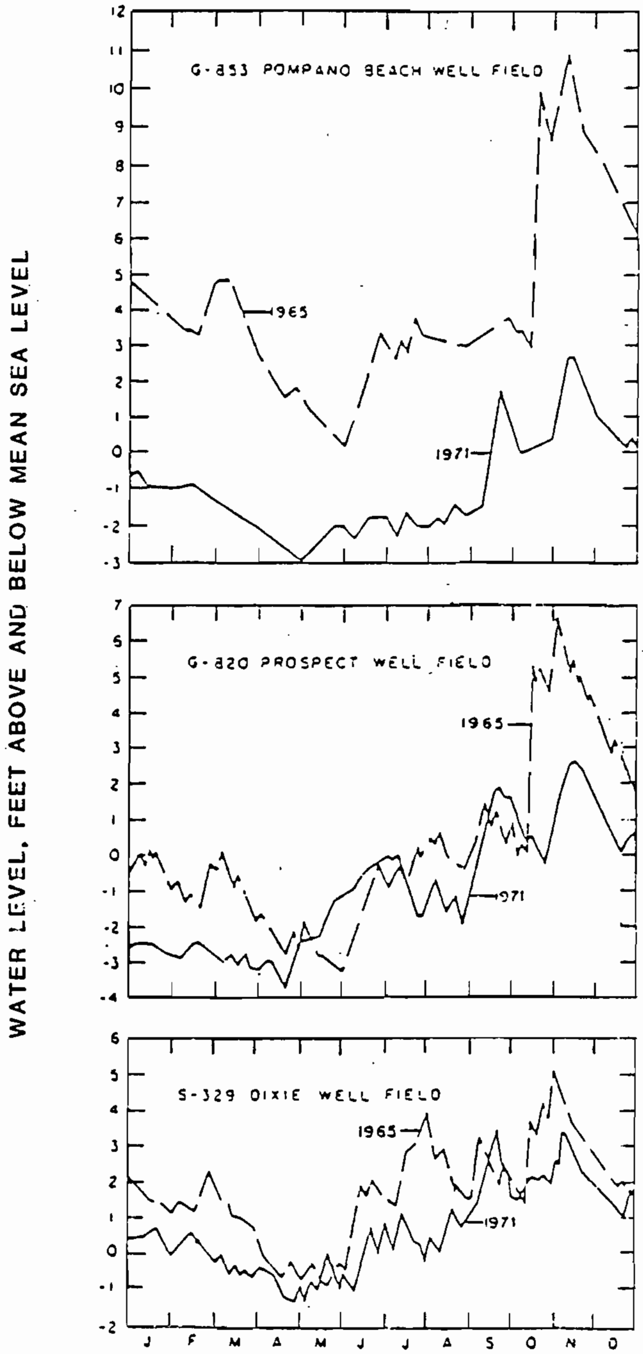
2.3.2.1 Subsurface Hydrologic Data for the Site

Aquifer pumping tests have been conducted at the Pompano Beach and Deerfield Beach well fields located approximately 2 miles south and 3 miles east of the Hilton Road site, respectively. Test data from the Pompano Beach well field test indicated a transmissivity of 1.4×10^6 gallons per day per foot (gpd/ft) and a storage coefficient of 0.34. Test results from the Deerfield well field show a transmissivity of 4.0×10^5 and a storage coefficient of 0.0004. Previous studies estimated the transmissivity of the upper sand layer (±60 feet) of the Biscayne aquifer to be 1.25×10^4 gpd/ft. Transmissivities for the limestone portion of the Biscayne Aquafer range from 4.0×10^5 gpd/ft in northern Broward County to 2.5×10^6 in southern Broward County. No storage coefficients have been reported for the Ft. Lauderdale area, however, a storage coefficient of approximately 0.015 has been estimated for the Prospect well field.

Figure 2.3.2.1 shows long-term water level fluctuations for several wells in the study area. Monitoring wells G-853 and G-820, which are closest to the Pompano well field, show a range of water level fluctuations in the order of ±10 feet with a possible decline resulting from well field pumpage. Monitoring well S-329, located within the Dixie well field, shows declining water levels apparently resulting from Dixie well field pumpage.

Wells G-561, G-1217, G-1220, and G-1215, Figure 2.3.2.2, are somewhat remote from the major well fields with water level fluctuations in the order of ±5 feet. Hydrographs for these wells are fairly stable for the record period.

Highest water levels tend to occur in October and lowest levels in April and May. The average difference between maximum and minimum water levels range from about 5 to 10 feet. Annual water level fluctuations at the three largest well fields (Pompano, Prospect, and Dixie) for a drought year (1971) and a non-drought year (1965) are shown on Figure

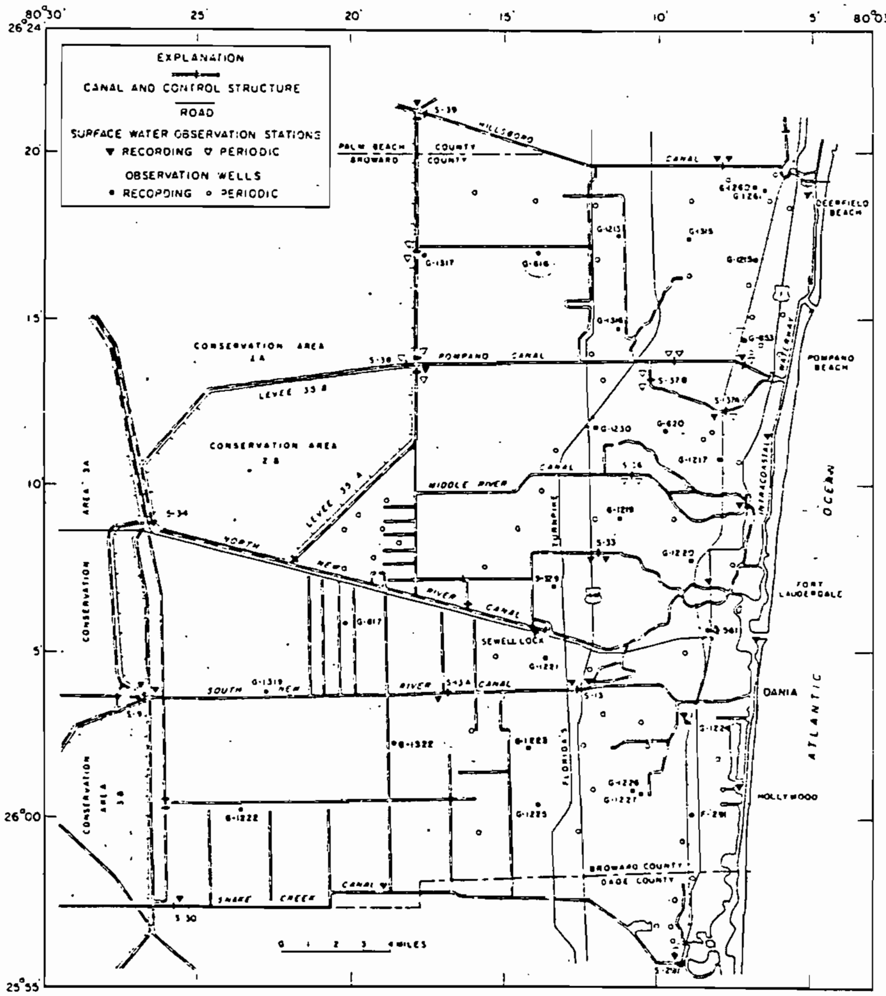


Hydrographs of wells in the Pompano Beach well field and the Fort Lauderdale Dixie and Prospect well fields, 1965 and 1971.

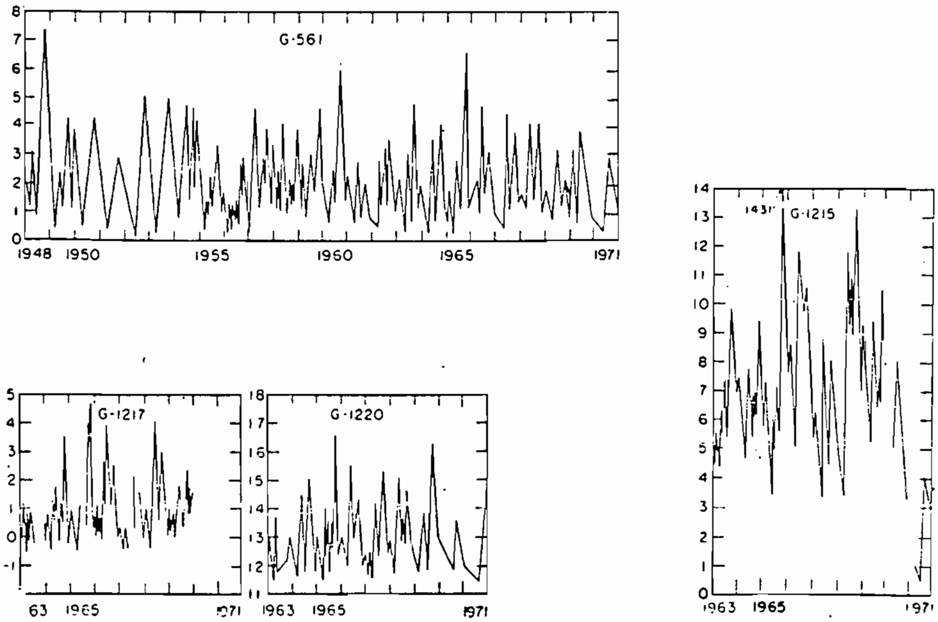
BROWARD COUNTY

ANNUAL FLUCTUATIONS OF WATER LEVELS AT THREE LARGE WELL FIELDS

BEST AVAILABLE COPY



WATER LEVEL OBSERVATION WELL LOCATIONS



HYDROGRAPHS OF WELLS IN THE COASTAL INTERCANAL AREAS OF BROWARD COUNTY

2.3.2.3. Water level declines are most pronounced during the first five months of the year when recharge is minimal and discharges from the well fields are maximum. Water levels rise from June through October because of seasonal rainfall and decreased pumping. The difference in water levels between the low period of the dry year (1971) and the high period of the wet year (1965) are as much as 14 feet.

An examination of available water level contour maps indicate that ground water flow is generally south/southeast, except near the coast where it is seaward. The most recent water level contour map (Figure 2.3.2.4), compiled by the USGS, indicates that ground water flow is generally easterly in the vicinity of the northern site. (Note this map probably represents ground water flow conditions within the medium to deeper portions of the Biscayne Aquifer).

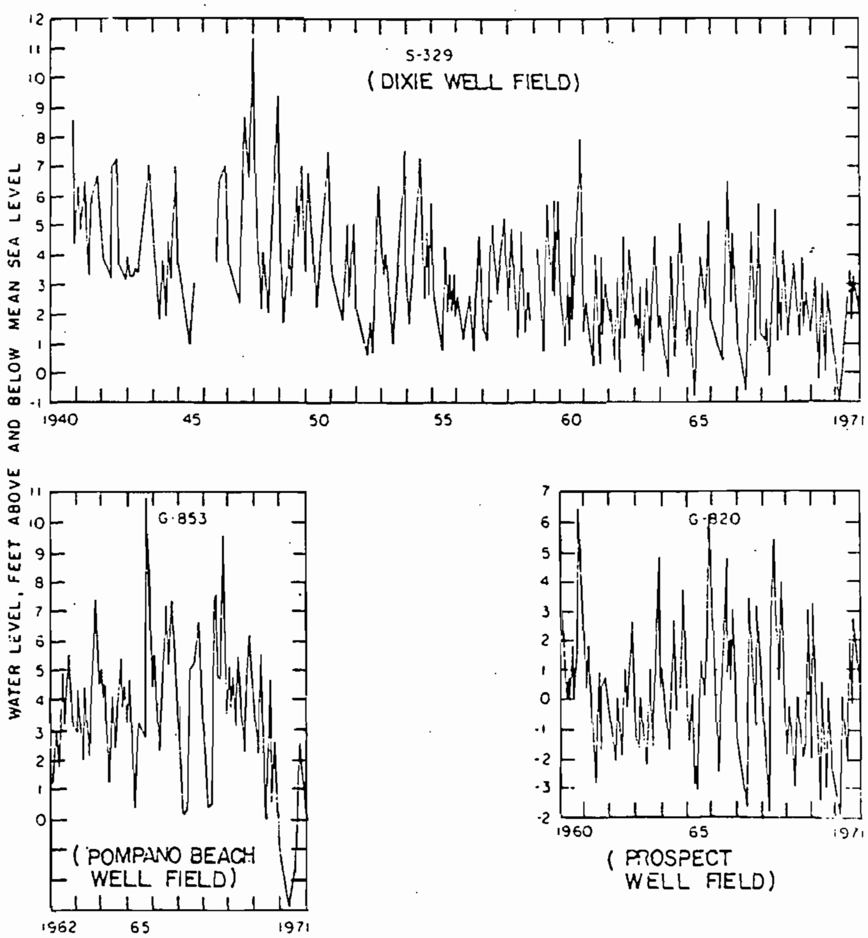
The source of all potable water in Broward County is groundwater from the Biscayne Aquifer which has been designated as sole source of drinking water for the area by USEPA.

Site Specific

The unsaturated zone varies little across the site and is generally 4 to 5 feet thick although according to the boring information in Appendix 10.8, it ranges from 0 to 8 feet. The variation may be attributed to heterogeneities in the fill material.

As shown in Figure 2.3.2.4, the site is located east of a water table high area in northern Broward County and flow direction is eastward towards coastal pumping centers.

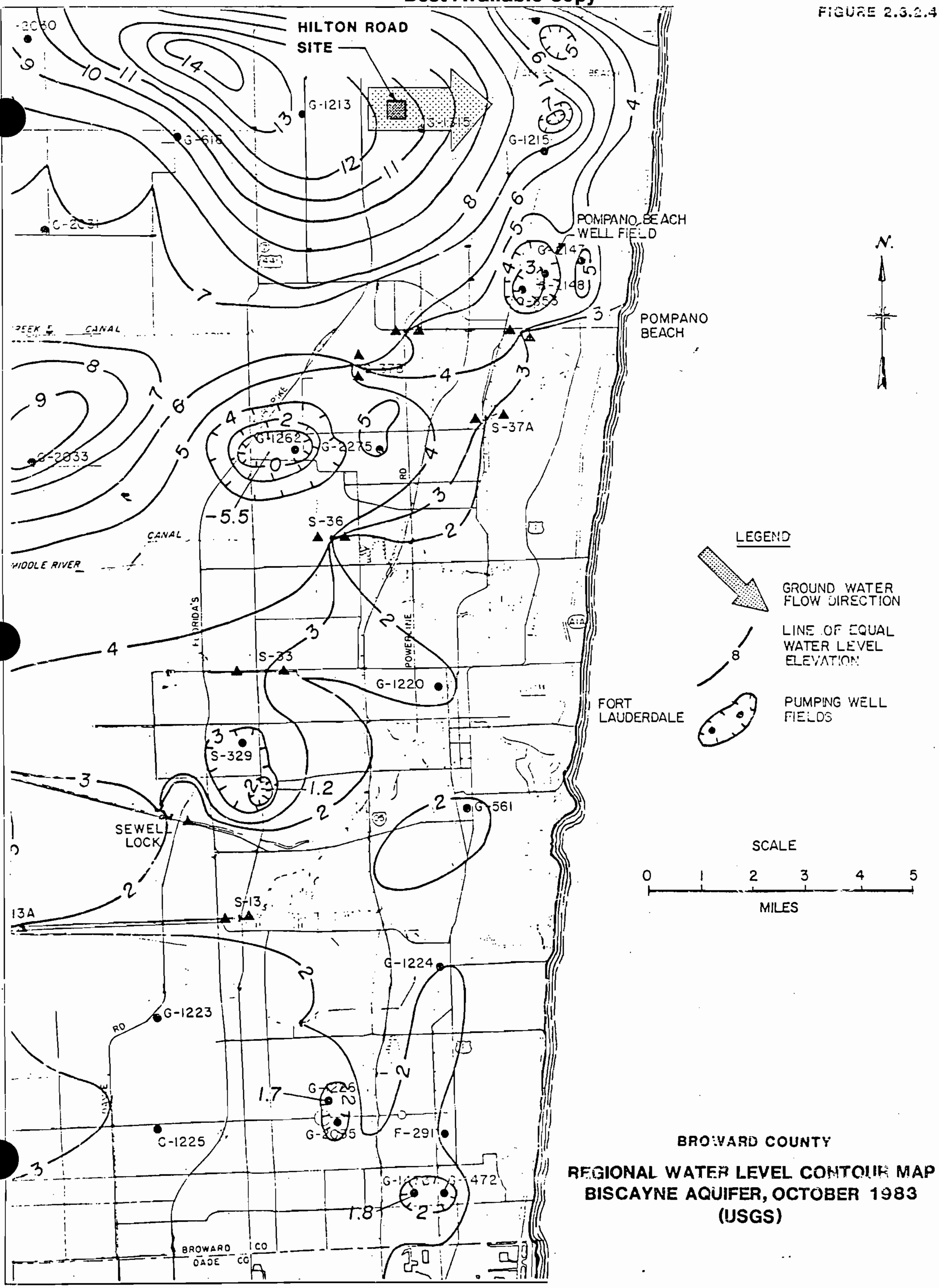
The Biscayne Aquifer system is recharged from rainfall (during the rainy season) and infiltration from canals and other surface water bodies (during the dry seasons). Discharge from the aquifer is by evapotranspiration, ground water



HYDROGRAPHS OF WELLS IN MAJOR WELL FIELD AREAS OF BROWARD COUNTY

BROWARD COUNTY

HYDROGRAPHS OF OBSERVATION WELLS IN BROWARD COUNTY AND THEIR LOCATIONS



BROWARD COUNTY

REGIONAL WATER LEVEL CONTOUR MAP
BISCAYNE AQUIFER, OCTOBER 1983
(USGS)

flow to canals and other surface water bodies and by withdrawals from production wells. The average annual rainfall is about 60 inches with approximately 70 percent of the total recharge from rainfall occurring between June and October. About 20 inches of the average annual rainfall (50 percent) is lost by evaportranspiration. The remaining 50 percent (20 inches) is available to the aquifer.

Permeabilities have been estimated from slug injection tests performed on a site 1 to 2 miles south (Malcolm Pirnie, 1984). These test indicate permeability coefficients in the range of 10^{-2} cm/sec to 10^{-3} cm/sec. This range can reasonably be extrapolated to the site, with the understanding that variations could result from occasional lenses of marl or fill material.

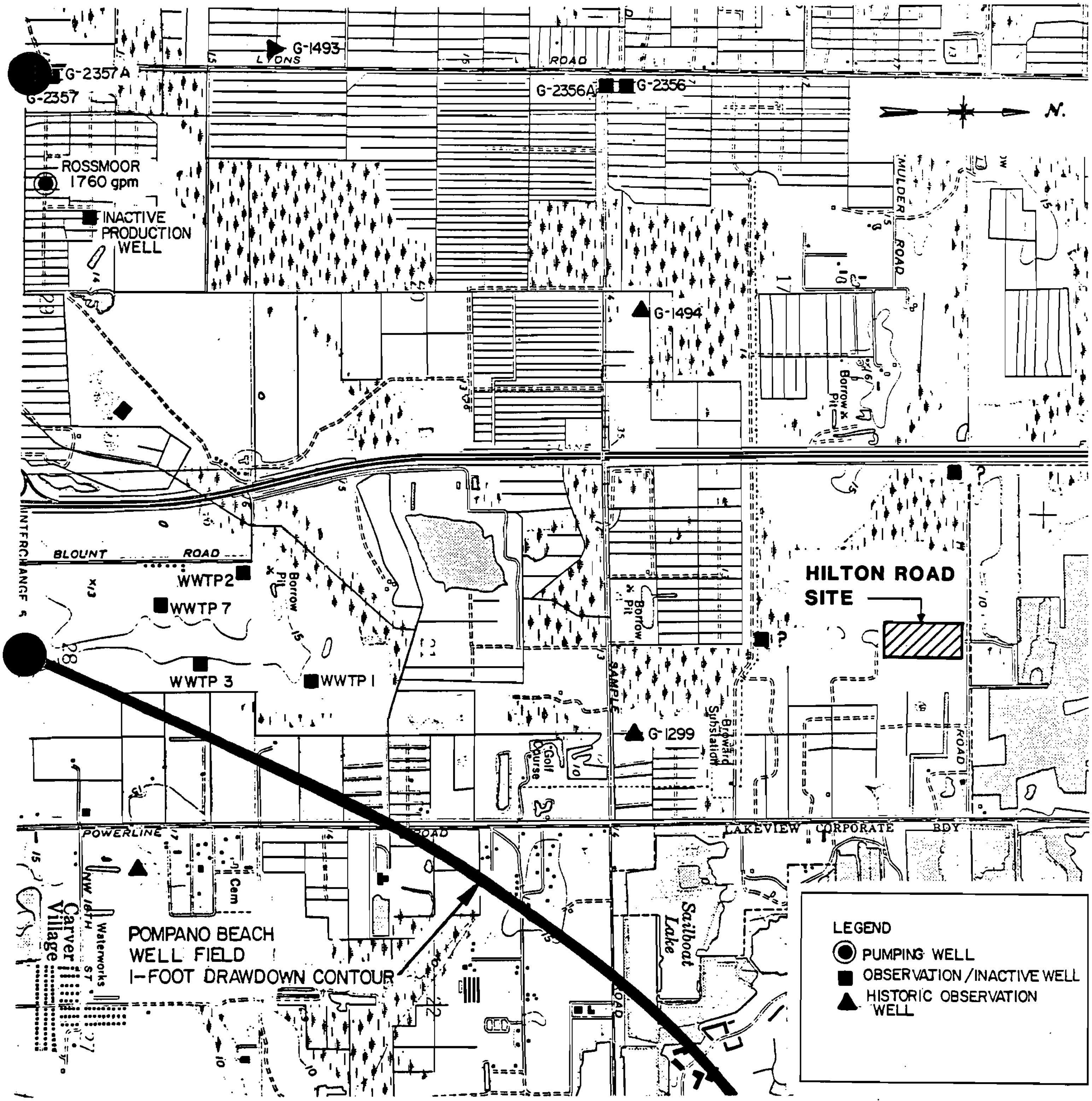
Water Quality

Considerable water quality data, from reports published by state agencies in the early 1960's, are available for the Biscayne Aquifer in the vicinity of the northern site. Table 2.3.2.1 contains water quality data for four wells within 1-1/2 miles of the site. These wells are all open to the middle zone of the Biscayne Aquifer (100 to 170 feet). None of these wells were accessible in early 1984, approximate locations are shown on Figure 2.3.2.5.

The water quality data which predates the Waste Management, Inc. landfill is of exceptable quality, with high bicarbonate, calcium and hardness levels characteristic of the Biscayne Aquifer.

The brackish/freshwater interface is located several miles east of the site, as mapped in May 1983, with 1,000 mg/L isochlor for the Biscayne Aquifer in the vicinity of U.S. Route 1. The Pompano Beach well field, about 3 miles south-

FIGURE 2.3.2.5



BROWARD COUNTY

HILTON ROAD SITE
LOCATION OF MAJOR WELL FIELDS AND MONITORING WELLS

SCALE: 1:24,000

TABLE 2.3.2.1

WATER QUALITY WITHIN 1-1/2 MILES OF COPANS ROAD SITE
(IN MG/L EXCEPT PH, SPECIFIC CONDUCTANCE, TEMPERATURE AND COLOR)

	Well Number			
	G-1494	G-1299	S-1516	G-1493
Date of Collection	3/12/64	4/14/64	4/6/62	3/12/64
Depth of Well (ft.)	106	145	150	165
Specific Conductance (umhos at 25 C)	650	741	752	740
pH	7.5	7.6	7.8	7.6
Temperature (F)	77	75	76	74
Silica (SiO_2)	13	15	17	11
Calcium (Ca)	123	138	126	138
Magnesium (Mg)	1.6	5.7	8.6	5.7
Sodium (Na)	17	23	30	22
Potassium (K)	1.3	1.0	1.6	1.2
Bicarbonate	384	388	412	392
Carbonate	0	0	0	0
Sulfate (SO_4)	0	31	0	32
Chloride (CI)	25	36	46	36
Fluoride (F)	0.3	0.2	0	0.2
Nitrate (NO_3)	0.1	0.2	0	0.1
Iron (Fe)	0.42	1.38	0.16	0.12
Dissolved Solids:				
Residue at 180 C	386	482	444	494
Calculated	373	441	432	439
Hardness:				
Calcium, Magnesium	326	368	350	368
Noncarbonate	12	50	12	47
Color	15	15	7	25

MALCOLM PIRNIE

east of the site, currently monitors chloride levels in several seaward observation wells for the detection of possible salt water intrusion.

Water samples were collected from the newly installed monitoring wells at the formerly proposed Copans Road Site on March 9, 1984, by Malcolm Pirnie (as per protocol in Section 10). Results of the laboratory analyses are presented in Table 2.3.2.2. The constituents analyzed for are indicators of landill and ash residue leachate. The data show elevated levels of calcium and bicarbonate indicative of natural carbonate waters, as well as high iron and manganese concentrations. Most of the heavy metal constituents were below analytical detection limits.

2.3.2.2 Karst Hydrogeology

The topography of the Broward County area is not characterized as Karst. Karst generally refers to characteristic terrain features which develop in purer limestone. The Biscayne Aquifer in this portion of Broward County is typically a carbonaceous sand indicative of an ancient offshore depositional environment where strong tidal currents had once prevailed.

2.3.3 Site Water Budget and Area Users

2.3.3.1 Site Water Budget

The important water source in the Project area which has the potential to be affected by Project implementation is the Biscayne Aquifer.

In the project area, the Biscayne Aquifer system is recharged from rainfall, infiltration from canals and other surface water bodies. Discharge from the aquifer is by evapotranspiration, ground water flow to canals, other surface water bodies and by pumping from wells. Average temperatures range from about 82° Fahrenheit in the summer to about 68°

TABLE 2.3.2.2

GROUND WATER QUALITY AT THE COPANS ROAD SITE
BROWARD COUNTY, FLORIDA (MARCH 1984 SAMPLING)

Constituents	North Well Cluster Deep	North Well Cluster Shallow	South Well Cluster Deep	South Well Cluster Shallow
Total Organic Carbon (TOC)	9.7	9.7	13	30
Chemical Oxygen Demand (COD	36	92	112	144
pH (standard units)	7.0	7.0	7.1	6.2
Specific Conductance (umhos)	620	360	280	134
Nitrate-N	<0.1	<0.1	<0.1	<0.1
Sulfate	48	14	20	4
Chloride	60	45	33	27
Potassium	1.3	5.2	4.6	7.6
Magnesium	6.2	4.3	4.7	4.8
Calcium	136	92	120	60
Ammonia	<0.1	<0.1	<0.1	<0.1
Bicarbonate (as HCO_3)	402.6	347.7	341.6	73.2
Total Alkalinity	330	285	280	60
Iron	9.85	4.59	44.0	19.4
Manganese	<0.05	<0.05	0.16	<0.05
Antimony	<0.1	<0.1	<0.1	<0.1
Arsenic	0.007	0.010	0.010	0.005
Beryllium	<0.001	<0.001	<0.001	<0.001
Cadmium	<0.01	<0.01	<0.01	<0.01
Total Chromium	<0.05	<0.05	<0.05	<0.05
Copper	<0.05	<0.01	0.13	0.08
Cyanide	<0.01	<0.01	<0.01	<0.01
Lead	<0.01	<0.01	<0.01	<0.01
Mercury	<0.001	<0.001	<0.001	<0.001
Nickel	<0.05	<0.05	<0.05	<0.05
Selenium	<0.001	<0.001	<0.001	<0.001
Silver	<0.01	<0.01	<0.01	<0.01
Thallium	<0.05	<0.05	<0.05	<0.05
Zinc	0.005	0.008	0.042	0.016

Note: All units in milligrams per liter (mg/L) unless otherwise stated.

Fahrenheit in the winter. Mean annual temperature is 73° Fahrenheit.

2.3.3.2 Area Water Uses

All surface waters of the State have been classified according to their designated uses, as follows:

Class I - Potable Water Supply

Class II - Shellfish Propagation or Harvesting

Class III - Recreation, Propagation and Management of Fish and Wildlife

Class IV - Agricultural Water Supplies

Class V - Navigation, Utility and Industrial

Broward County is entirely within The Lower Florida River Basin (No. 28). All surface waters in this basin are classified as Class III - Recreation Propagation and Management of Fish and Wildlife with the exception of a small abandoned rockpit in North Broward which is classified as Class I - Potable Water Supply (FAC 17-3). The main functions of the canals in Broward County are to provide drainage in low-lying areas and prevent salt water intrusion. A further discussion of the canal system is provided in Section 2.3.4, Surficial Hydrology.

2.3.3.3 Well Inventory

The Pompano Beach well field is located two or three miles east of the site and has 15 water supply wells. Several new wells form the smaller New Pompano Beach well field about two miles south and southwest of the site. The combined cones of depression from the two Pompano Beach well fields are represented by the one foot drawdown contour (Figure 2.3.2.3) just southeast of the site.

Rossmoor Florida Limited Partnership operates a 350-foot deep 10-inch diameter well (1,750 gpm capacity) for golf course irrigation. This well is located about 2 to 3 miles southwest of the site (Figure 2.3.2.5). There are a few deep observation wells within one to two miles of the site boundaries. Two pairs of USGS wells are located (Figure 2.3.2.5) about 1-1/2 miles to southwest of the site to monitor the middle of the Biscayne Aquifer. Those wells are 1 to 2-inch diameter with the following depths:

Observation Well No.	Measured Depth in Feet
G-2356	>100
G-2356A	57
G-2357	85
G-2357A	58

In addition, two inactive Rossmoor supply wells (±350 feet deep) are located about one mile southeast of site.

Four shallow water table wells were installed by Broward County to monitor possible sludge disposal impacts. They are located about 2 miles to the south of the northern site. These wells are 2-inch diameter and screened about 20 feet below grade. Numerous observation wells have reportedly been installed by Waste Management, Inc. to monitor leachate migration from their landfill. The USGS has been involved (early 1984) in the installation of two deep monitoring wells at the northwest and southeast corners of the landfill site. Geologic logs, water level, and water quality information are not available for these wells.

As part of Broward County's long range aquifer protection plan, cones of depression for major pumping centers in the County were determined from long term water level changes in observation wells. These data were used to determine travel time contours to the major pumping centers which were plotted on aerial photos as contours of equal travel time to pumping wells, i.e., 10 days, 30 days, 210 days. In certain cases (e.g., Pompano Beach well field) a one-foot drawdown contour was also plotted (Figure 2.3.2.5).

2.3.4 Surficial Hydrology

2.3.4.1 Hydrologic Characterization

Regional

Due to Florida's high local precipitation rates, low land surface elevation, and general flat topography, much of Broward County was originally swamp or marsh lands. Upon completion of several drainage projects, Broward County was rendered developable. Drainage areas are exceptionally difficult to define due to the topographic relief and canal systems, however, dominant overland flows are to the south and southeast, and the canals flow toward the Intracoastal Waterway. The only exception is the western portion of the C-11 or South New River Canal in the south central section of Broward County, which is backpumped 3/4 of an inch of runoff per acre per day into the Conservation Area.

Site-Specific

The project site is influenced by two major canals. The Hillsboro Canal is located approximately five miles north of the site and flows southeast and east. The water level in the canal is regulated by locks to the east. The Pompano Canal (C-14) is located approximately 2-1/2 miles south of the site and flows to the east. The water levels in the Pompano Canal are regulated by a control structure at Levee 36 to the west, a control structure east of the Cypress Creek Canal intersection, and a control structure at Pompano Beach. The operation of canal control structures is managed by the SFWMD. During periods of high rainfall, the structures are opened to prevent flooding. During dry periods, the canals are used to transport water from Lake Okeechobee and the Conservation Areas to the coastal areas to recharge the aquifer.

Several small lakes, water-filled borrow pits, and canals are located in and around the site. The water levels in these surface water bodies fluctuate similarly with the groundwater levels. During dry periods, the water levels in the surface water bodies decline due to evaporation and lower water table levels. Surface water levels usually decline more rapidly than the surrounding water table resulting in groundwater flow into these water bodies. During periods of high rainfall, the surface water levels rise more rapidly than the groundwater levels, and recharge to the aquifer occurs.

Surface water flow in the drainage canal east of Central Disposal Landfill Cell No. 1 (CDSL 1) is regulated by a control structure south of Sample Road. The elevation of the structure is 10 feet above mean sea level (amsl). When the stage of the canal north of the structure is greater than the elevation of 10 feet amsl, canal water flows to the south toward the Pompano Canal. When the canal stage north of the structure is less than 10 feet amsl, surface water flows north to the Hillsboro Canal. Stage data collected from staff gages installed in the canal east of CDSL 1 (Figure 2.3.4.1) indicate that the canal stage is below 10 feet amsl during the dry season and above this elevation during the wet season (Figures 2.3.4.2 and 2.3.4.3). Therefore, surface water flows north during the dry season and south during the wet season.

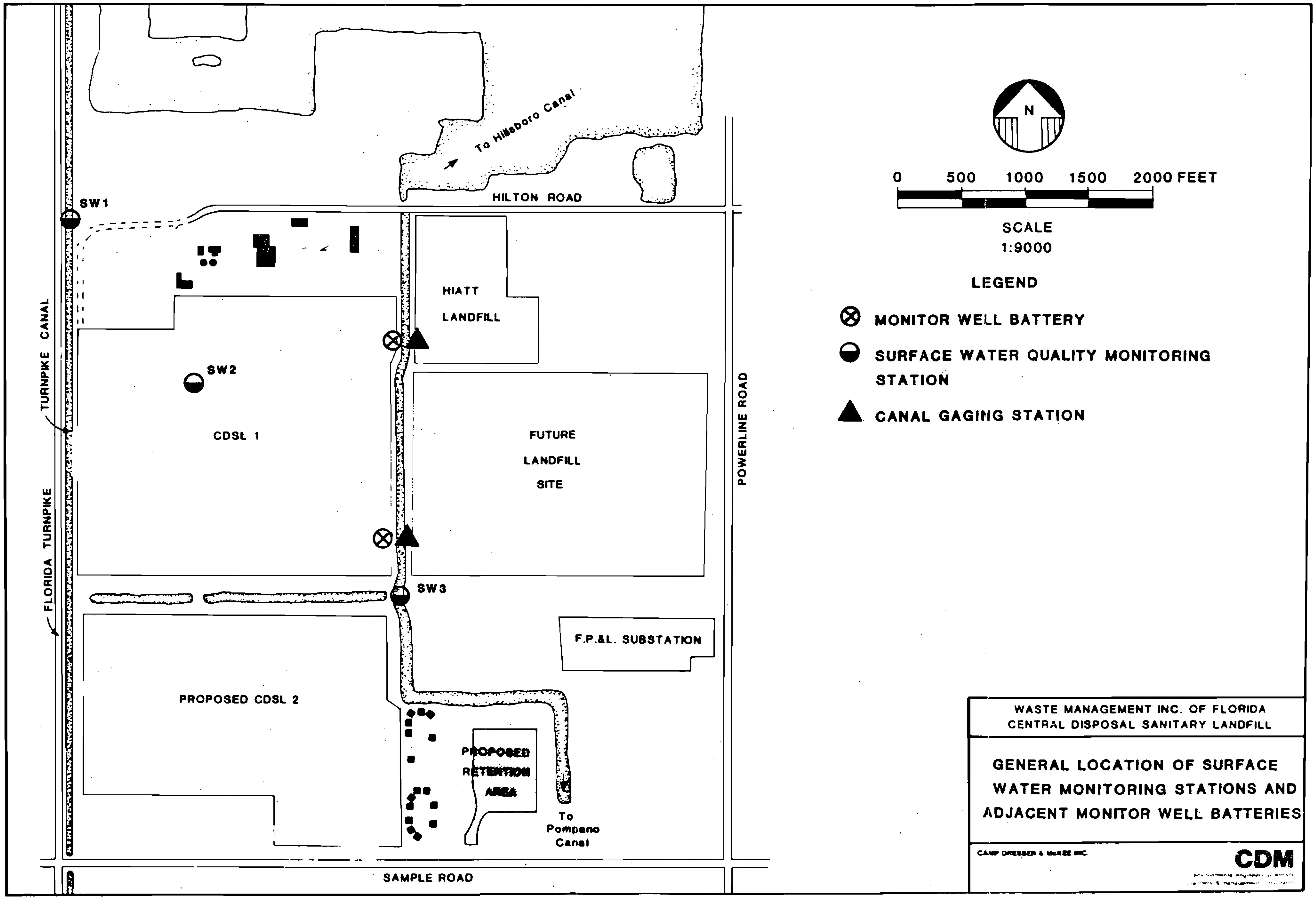
The interaction between surface water and groundwater adjacent to CDSL 1 was studied by comparing SFWMD drainage canal stage data with water table elevation data collected at WMI monitor cells 4 and 5 (Figure 2.3.4.1). Figures 2.3.4.2 and 2.3.4.3 are hydrographs showing canal stage and water table elevations for the adjacent aquifer. Generally, groundwater is at a higher elevation than the adjacent surface water. This relationship suggests that groundwater is contributing to surface water flow in the adjacent canal. The contribution of groundwater to surface water occurs during both the wet and dry seasons (Figures 2.3.4.2 and 2.3.4.3), since the water table elevation beneath CDSL 1 is continuously higher than the canal stage elevation. Figure 2.3.4.4 is a schematic illustrating the flow field around the SFWMD drainage canal.

Surface water quality monitoring has been ongoing at CDSL 1 since 1975. Waste Management, Inc. monitors water quality in three cnaals and the location of surface water sample collection are presented in Figure 2.3.4.1.

- o SW1 - Sample station located on the turnpike canal northwest of CDSL 1 since 1975. This station represents background surface water quality.
- o SW2 - Sample station located in a pre-oxidation pond west of the effluent spraying project and just north of the oxidation pond.
- o SW3 - Sample station located at the intersection of the FP&L right-of-way and the SFWMD drainage canal, southeast of CDSL 1. This station monitors water quality of surface water flowing toward the Pompano/Cypress Creek canal system.

Table 2.3.4.1 presents analytical results for the most recent set of samples analyzed for the full suite of parameters for Samples SW1, SW2, and SW3 collected on October 24, 1981 (Appendix 10.9). Quarterly results from October, 1983 to July, 1985 for selected parameters are presented in Appendix 10.9. The overall sampling schedule is also presented in Appendix 10.9. The overall quality of background and landfill surface water is poor and the overall conditions have not changed since the last set of samples were collected. Selected parameters exceed BCEQCB Standards for Surface Water (Appendix 10.9). Samples exceeding these standards are presented in Table 2.3.4.2.

Background surface water (SW1) exceeds BCEQCB standards for turbidity, COD, total phosphorus, oil-grease, and total coliform (Table 2.3.4.2). SW2 water is poorer in quality than SW1, with concentrations exceeding standards for all the parameters presented in Table 2.3.4.2.

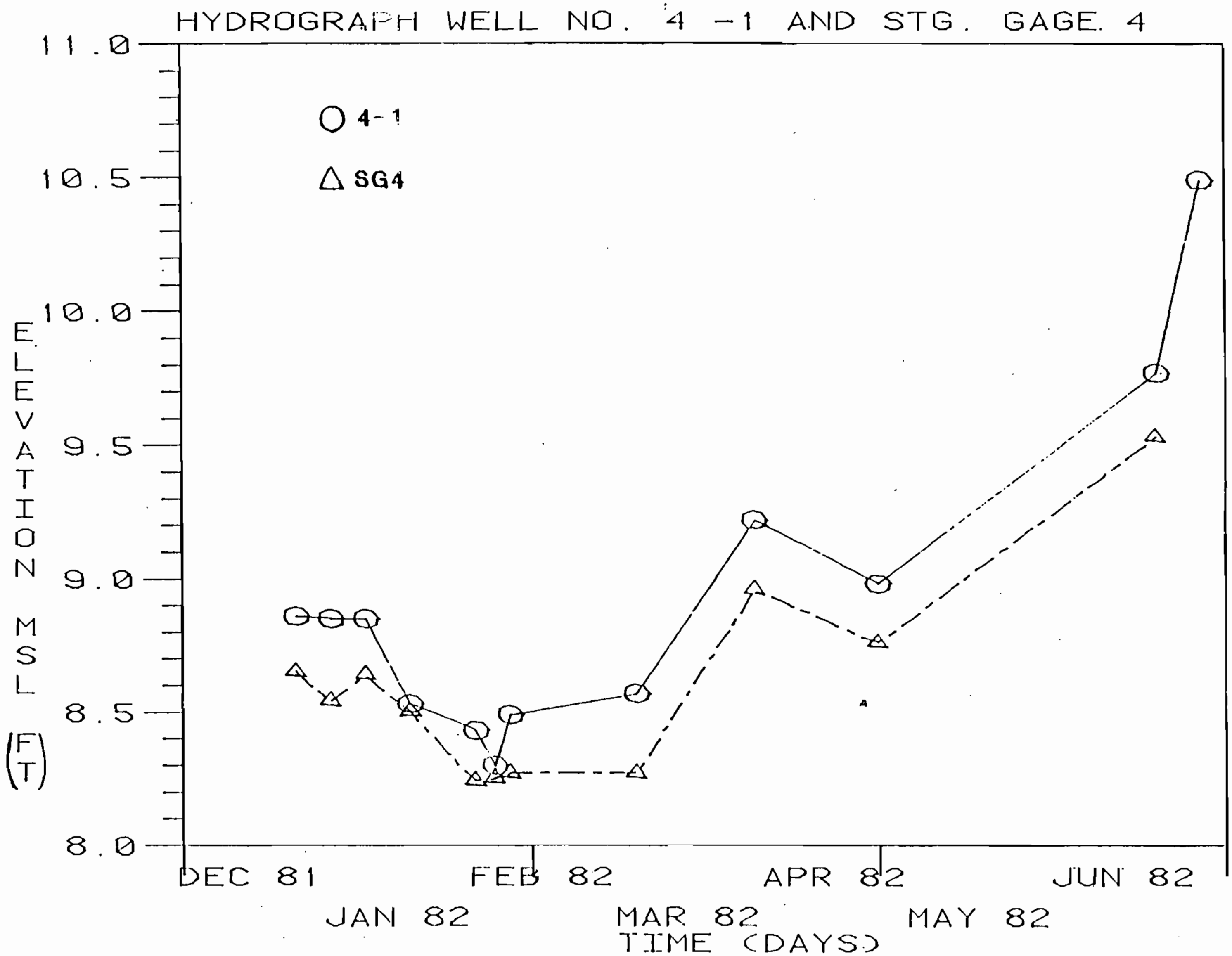


WASTE MANAGEMENT INC. OF FLORIDA
CENTRAL DISPOSAL SANITARY LANDFILL

GENERAL LOCATION OF SURFACE WATER MONITORING STATIONS AND ADJACENT MONITOR WELL BATTERIES

CAMP DRESSER & McKEE INC.

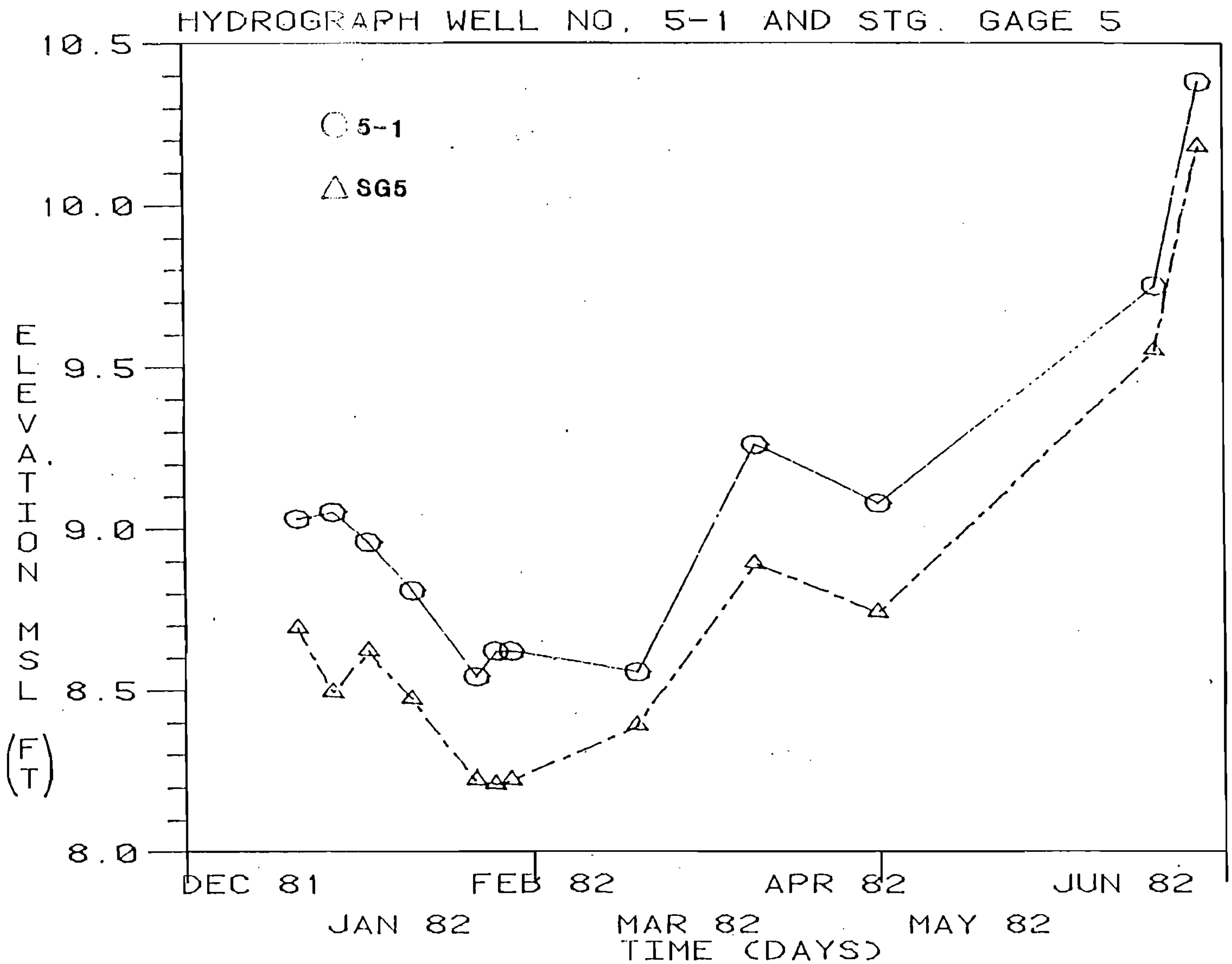
CDM



BROWARD COUNTY

HYDROGRAPH COMPARING CANAL STAGE AND GROUNDWATER TABLE ELEVATION AT SITE 4

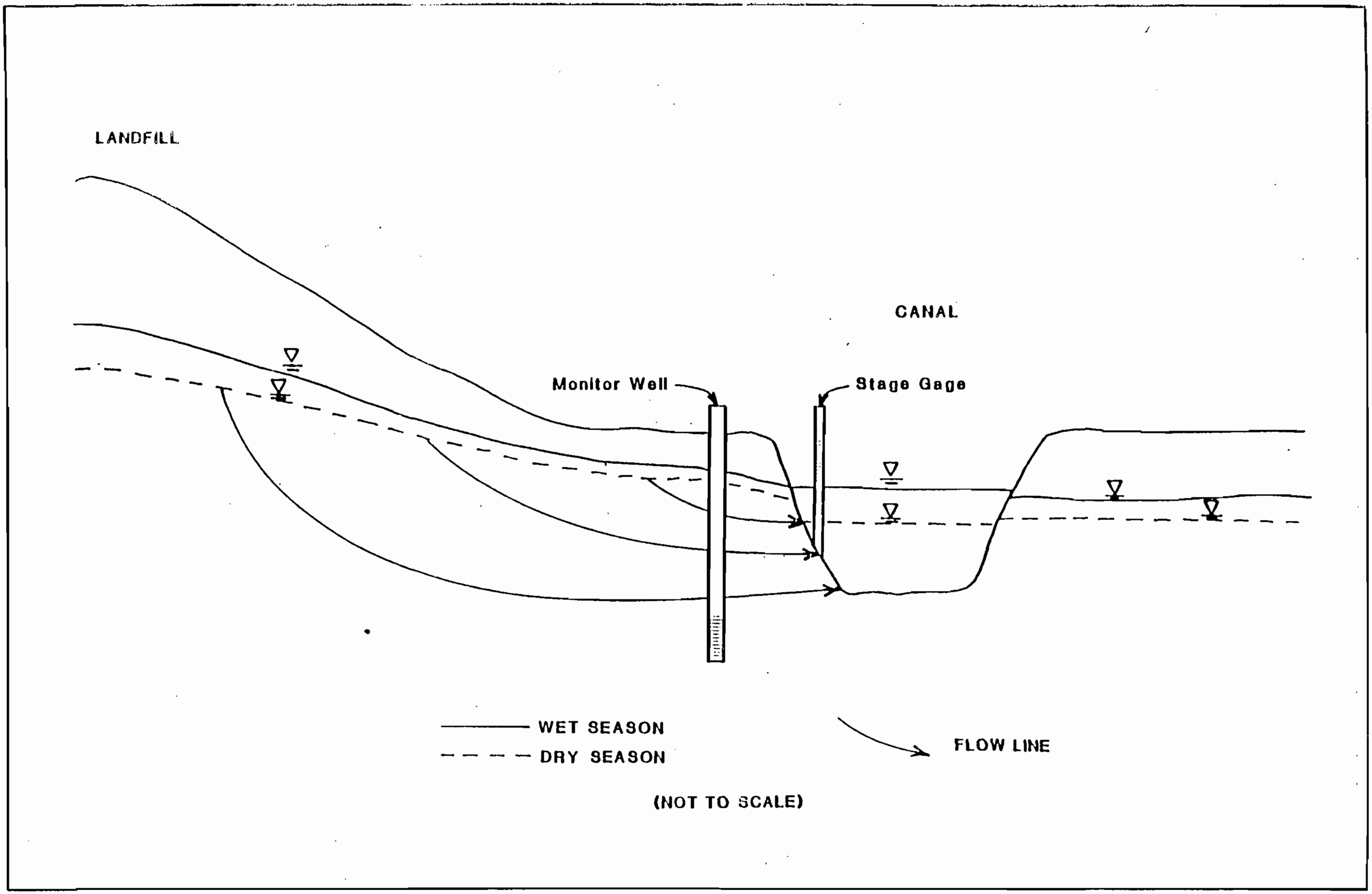
FIGURE 2.3.4.2



BROWARD COUNTY

HYDROGRAPH COMPARING CANAL STAGE AND GROUNDWATER TABLE ELEVATION AT SITE 5

FIGURE 2.3.4.3



BROWARD COUNTY

SCHEMATIC SHOWING FLOW FIELD AROUND SFWMD DRAINAGE CANAL

FIGURE 2.3.4.4

TABLE 2.3.4.1

ANALYTICAL RESULTS FOR SURFACE WATER QUALITY SAMPLES
COLLECTED OCTOBER 24, 1981

Constituent or Parameter	SW1	SW2	SW3
<u>Physical</u>			
Hardness (mg/l)	296	388	236
pH (S.U.)	7.1	7.5	7.0
Temperature (°C)	27.0	27.0	27.0
Turbidity (NTU)	45	45	21
Specific Conductance (umhos/cm)	920	980	950
<u>Inorganics (mg/l)</u>			
Alaklinity	240	360	212
Aluminum	<2	<2	<2
Arsenic	<0.001	<0.001	<0.001
Bicarbonate	146	220	129
Boron	0.24	0.64	0.17
Cadmium	<0.002	<0.002	<0.002
Calcium	114	152	90
Chloride	47	62	63
Chromium	<0.004	<0.004	<0.004
Chromium (CR^{+6})	<0.005	<0.005	<0.005
Cobalt	<0.004	0.006	0.005
COD	224	264	286
Copper	0.003	<0.003	<0.003
Dissolved Solids	512	624	504
Fluoride	0.11	0.24	0.09
Iron	0.06	0.07	0.05
Lead	<0.003	0.038	0.005
Magnesium	4.8	ND	ND
Manganese	0.014	0.005	0.006
Mercury	<0.0001	<0.0001	<0.0001
Nickel	0.006	0.008	0.006
Noncarbonate Hardness	56	28	24
Silica	3.7	4.8	5.5
Sodium	48	42	50
Strontium	0.88	2.1	0.83
Sulfate	12	12	21
Total Nitrogen	1.1	14	1.4
Total Nitrate N	0.72	2.7	4.7
Total Nitrite N	0.011	0.012	0.008
Total Ortho Phosphorus	0.05	0.23	0.41
Total Phosphorus	0.08	0.39	0.66
Vanadium	<0.04	<0.04	<0.04
Zinc	0.03	0.07	0.05

TABLE 2.3.4.1 (continued)

ANALYTICAL RESULTS FOR SURFACE WATER QUALITY SAMPLES
COLLECTED OCTOBER 24, 1981 (continued)

Constituent or Parameter	SW1	SW2	SW3
Organics (mg/l)			
Aldrin	<0.00006	<0.00003	<0.00002
Chlorodane	<0.00009	<0.0004	<0.0001
DDD Total	<0.0006	<0.0003	<0.0002
DDE	<0.0004	<0.0002	<0.0002
DDT	<0.001	<0.0005	<0.0004
Diazinon	<0.0008	<0.0004	<0.0003
Dieldrin	<0.0005	<0.0002	<0.0002
Endrin	<0.0003	<0.0002	<0.0001
ETH, Parathion	<0.0005	<0.0003	<0.0002
ETH, Trithion	<0.001	<0.0006	<0.0004
Ethion	<0.001	<0.0006	<0.0004
Heptachlor Epoxide	<0.0004	<0.0002	<0.0002
Heptachlor	0.0002	<0.0003	<0.00009
Lindane	<0.0001	<.00006	<0.00004
M.B.A.S.	0.01	0.09	0.05
Met. Parathion	<0.0004	<0.0002	<0.0002
Met. Trithion	<0.003	<0.002	<0.001
Oil and Grease	7	12	12
PCB	<0.0003	<0.0003	<0.0002
PCNB	<0.002	<0.0001	<0.00007
Phenols	<0.001	0.012	0.006
Silvex	<0.0003	<0.0004	<0.0003
Total Ammonia	0.42	1.7	1.7
Total Organic Carbon	6	37	36
Total Organic Nitrogen	0.83	7	1.2
Toxaphene	<0.004	<0.002	<0.002
2,4,5-T	<0.0003	<0.0004	<0.0004
2,4-D	<0.0006	<0.0007	<0.0009
2,4-DP	<0.001	<0.001	<0.002
Bacteria (mg/l)			
Fecal Coliform/100 ml	270	1,200	270
Total Coliform/100 ml	3,400	10,000	900
Fecal Strep/100 ml	25	60	12
5-Day BOD	5.4	5.7	4.2

ND = not determined

MALCOLM PIRNIE

TABLE 2.3.4.2

PARAMETERS EXCEEDING BCEQCB SURFACE WATER QUALITY STANDARDS IN SURFACE WATER SAMPLES COLLECTED OCTOBER 24, 1981

Constituent or Parameter	Units	SW1	SW2	SW3	BCEQCB Standard
Physical					
Turbidity	NTU	45	45	21	10
Inorganics					
COD	mg/l	224	264	286	10
Lead	mg/l	NE	0.038	NE	0.03
Total Nitrogen	mg/l	NE	14	NE	1.5
Total Phosphorus	mg/l	0.08	0.39	0.66	0.02
Zinc	mg/l	NE	0.07	0.05	0.03
Organics					
Oil-Grease	mg/l	7	12	36	1
Phenols	mg/l	NE	0.012	0.006	0.001
Bacteria					
Fecal Coliforms	count/100 ml	NE	1,200	NE	800
Total Coliforms	count/100 ml	3,400	10,000	NE	1,000

NE = standard not exceeded

SW3 surface water represent water flowing away from CDSL 1 boundaries. SW3 analytical results exceed BCQCB standards for turbidity, COD, total phosphorus, zinc, oil-grease, and phenols. The lack of baseline surface water quality data makes it difficult to determine the amount of any contamination contributed by CDSL 1. However, zinc and phenols are two possible contaminants observed in higher concentrations in SW2 and SW3 than in SW1 (Table 2.3.4.2). The presence of high concentrations within the landfill boundary (SW2) and lesser concentrations in the adjacent SFWMD drainage canal suggest that the landfill may be a source of higher concentrations of zinc and phenols. Other possible sources of contamination include:

- Sand and gravel mining north and northeast of CDSL 1.
- Previous landfill operations at the abandoned county and Hiatt landfills.
- Previous sewage sludge disposal at the abandoned county landfill.
- Contaminants introduced in the drainage canal due to urban runoff and construction associated with Powerline, Hilton, and Sample Roads.
- Irrigation and other agricultural activities adjacent to CDSL 1.

2.3.4.2 <u>Measurement Programs</u>

The programs and methods for measuring background physical and chemical parameters of surface waters which have potential of being affected during construction and/or operation of the resource recovery facility is described in Section 2.3.4.1, Hydrologic Characterization.

2.3.5 <u>Vegetation/Land Use</u>

The site has been cleared, scraped, and bulldozed in the past so that the surface is irregular with low areas and dirt mounds scattered throughout. A business establishment formerly occupied the northeast section of the site. The northwest section of the site is a paved parking area adjacent to the CDSL landfill maintenance building.

A plant species list was developed during a field vegetative study (see Appendix 10.7) and is presented in Table 2.3.5.1.

2.3.5.1 Vegetative Survey

There is sparse vegetative cover in the eastern section and herbaceous species, primarily grasses, dominate this portion of the site. They include Bermuda grass (Cynodon dactylon), sandspur grass (Cenchrus echinatus), blue stem grasses (Andropogon spp.), white beggar-ticks (Bidens pilosus), common ragweed (Ambrosia attemisiifolia), dog fennel, camphor weed (Heterotheca subaxillaris), wild balsam apple (Momordica charantia) and many other mostly annual weedy species. The western section of the site is mostly paved parking areas.

The canal crossing the site is 4 to 5 feet below the surface in most areas and are lined by Brazilian pepper-tree and castor bean (Ricinus communis). However, there are some low spots bordering the canal on the southeast which support the following species: cattails (Typha domingensis), Carolina willow (Salix caroliniana), primrose willow (Ludwigia peruviana), camphor weed (Pluchea purpurascens) and a few Melaleuca (Melaleuca quinquenervia) saplings. This canal will be relocated due to the Central Disposal landfill expansion. The relocation will be accomplished before the construction of the proposed facility is started.

2.3.5.2 Sensitive Plant Species

No environmentally significant species (i.e. rare, unique, threatened, endangered, or indicative of significant connected wetland areas) as indicated in Table 2.3.5.2 were

TABLE 2.3.5.1

List of vascular plants identified during field reconnaissance, September 12, 1985, undeveloped portion of the Hilton Road Resource Recovery Facility site, Broward County, Florida.

Scientific Name	Common Name
Ambrosia artemisiifolia	ragweed
Andropogon spp.	blue stem grasses
Bidens pilosus	white beggar-ticks
Cenchrus echinatus	sandspur grass
Cynodon dactylon	Bermuda grass
Heterotheca subaxillaris	camphor weed
Ludwigia peruviana	primrose willow
Melaleuca quinquenervia	Melaleuca
Momordica charantia	wild balsam apple
Pluchea purpurascens	camphor weed
Ricinus communis	castor bean
Salix caroliniana	Carolina willow
Typha domingensis	cattails
Leucaena leuedcephala	lead tree
Pennisetum americanum	pearl millet
Echinochloa crusgalli	barnyard grass

TABLE 2.3.5.2

VEGETATION, REPORTED FROM BROWARD COUNTY, CONSIDERED TO BE RARE (R), THREATENED (T), OR ENDANGERED (E)

Scientific Name	Common Name	Florida State (1978)[1]	REBF[2]	Florida Statutes[3]
Acrostichum danaeae-folium	Leather Fern		T	
Asplenium dentatum	Toothed Spleenwort	T	T	
Asplenium serratum	Bird's nest Spleenwort	T	E	
Coccothrinax argentata	Silver Palm	E	T	
Cocos nucifera	Coconut Palm	T		
Commelina gigas	Giant, or Climbing Dayflower	T	T	
Drosera intermedia	Water Sundew		R	
Ernodea littoralis	Beach Creeper		T	
Gossypium hirsutum	Wild Cotton		E	
Jacquemontia reclinata	Beach Jacquemontia		E	
Mallontonia gnaphalodes	Sea-Lavender		T	
Nemastylis floridana	Fall-flowering Ixia	T	T	
Okenia hypogaea	Burrowing Four-o'clock		E	
Ophioglossum palmatum	Hand Fern	E	E	
Pleopeltis revoluta	Star-scale Fern		E	
Polygala smallii	Tiny Polygala		E	
Remirea maritima	Beach-Star		E	
Roystonea elata	Florida Royal Palm			E
Sabal palmetto	Cabbage Palm	T		
Tillandsia fasciculata	Wild Pine Bromeliad			E
Tillandsia flexuosa	Twisted Air-plant	T	T	
Zamia floridana	Florida Coontie	T	T	

1. State of Florida. 1978. Preservation of native flora of Florida. Chapter 78-72.

2. Ward, D.B. 1979. Rare and endangered biota of Florida, Vol. 5: Plants. Univ. Presses of Florida, Gainesville, 175 pp.

3. Section 581.185, Florida Statutes.

MALCOLM PIRNIE

observed on the site. All species observed are typical of those found on disturbed sites in south Florida.

2.3.6 Ecology

Figure 2.3.6.1 illustrates endangered species critical habitats in the southern half of the State of Florida. Table 2.3.6.1 is a listing of vertebrates which are endangered, threatened or rare species or species of special concern found in the southern half of the State. Site survey and analysis have not identified any threatened or endangered species on the Project site and the probability of their presence is low.

Based on the vegetation survey conducted for the undeveloped portion of the proposed facility site on September 12, 1985, the vertebrates listed in Table 2.3.6.2 likely occur in the area. As the land parcel is developed for the Project, it is anticipated that these species will relocate to areas adjacent to the site. Some habitat will be lost due to development, but no significant impact on vertebrate species populations in the region is expected.

2.3.6.1 Species-Environmental Relationships

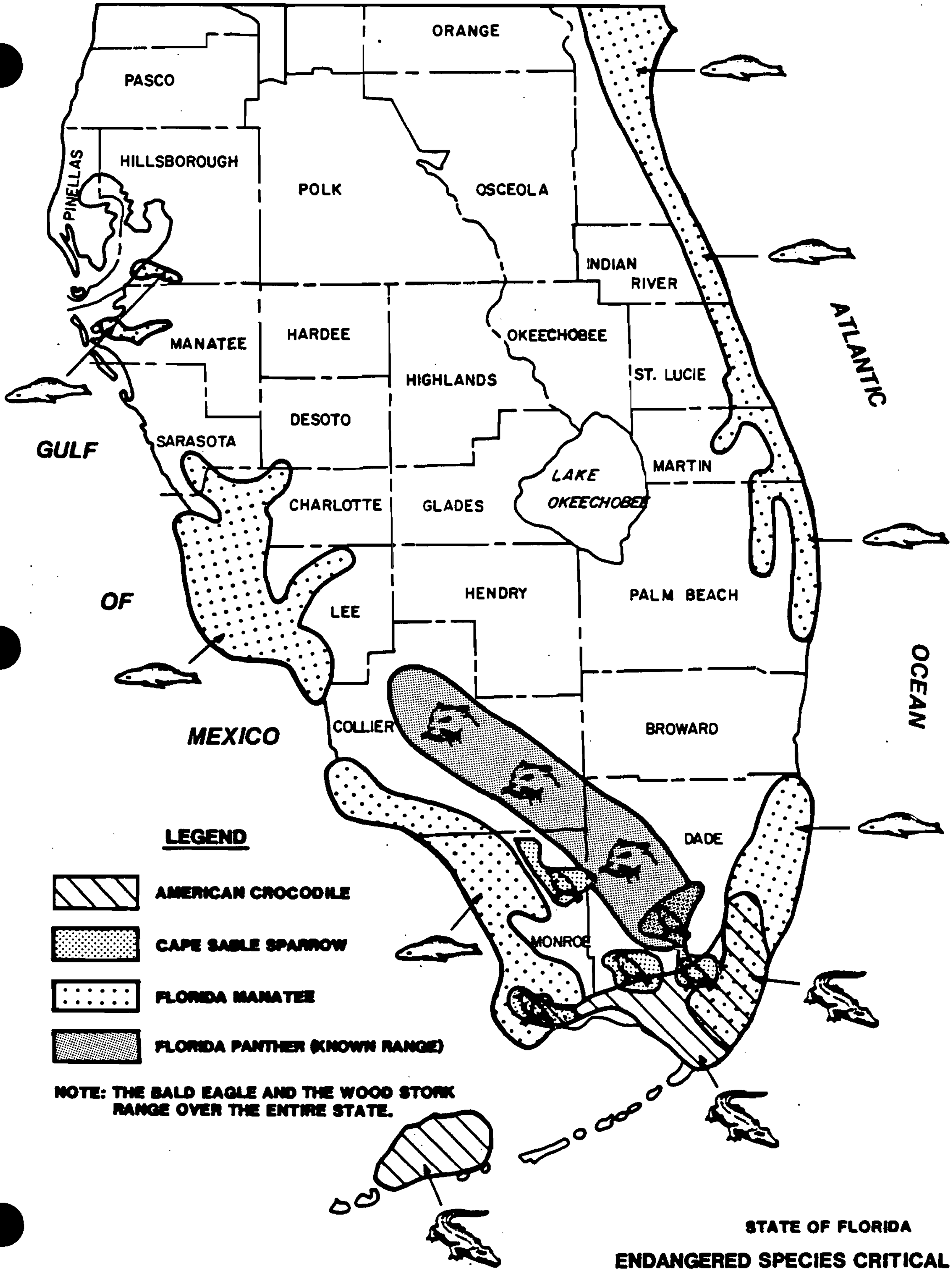
The Resource Recovery Project is not anticipated to have significant adverse effects on the area ecology. Terrestrial fauna can move to adjacent land. In addition, those species believed to inhabit the site are generally adapted to areas previously disturbed by humans and co-exist successfully.

2.3.6.2 Pre-existing Stresses

The site is located in an area that is primarily industrial and very low residential. On-site ecological conditions indicate the occurrence of stress as a result of previous alterations.

2.3.6.3 Measurement Programs

A surface water sampling program is performed near the site on a quarterly basis. Also, a field vegetative study was conducted in September, 1985. This data is presented in Section 2.3.5.1. No other vegetative measurement programs will be required for this Project.



STATE OF FLORIDA

ENDANGERED SPECIES CRITICAL HABITATS

Source: U.S. Fish and Wildlife Service

TABLE 2.3.6.1

VERTEBRATES, REPORTED FROM BROWARD COUNTY, CONSIDERED TO BE ENDANGERED (E), THREATENED (T), RARE (R), A SPECIES OF SPECIAL CONCERN (SSC), OR OF STATUS UNDETERMINED (SU)

Scientific Name	Common Name	USDI (1979)[1]	State of Fla. (1978)[2]	Pritchard (1978)[3]
MAMMALS				
Sciurus niger avicennia	Mangrove Fox Squirrel	E	E	E
Felis concolor coryi	Florida Panther	E	E	E
Ursus americanus floridanus	Florida Black Bear		T	T
Mustela vison evergladensis	Everglades Mink		T	T
Trichechus manatus latirostris	Manatee	E	T	T
Neofiber alleni	Round-tailed Muskrat			SSC
BIRDS				
Mycteria americana	Wood Stork			E
Rostrhamus sociabilis plumbeus	Florida Everglade Kite	E		E
Piocoires borealis hylonomus	Red-cockaded Woodpecker	E	E	E
Pelecanus occidentalis carolinensis	Eastern Brown Pelican	E	T	T
Fregata magnificens rothschildi	Magnificent Frigate-bird		T	T
Haliaeetus l. leucocephalus	Southern Bald Eagle	E	T	T
Pandion haliaetus	Osprey		T	T
Falco sparverius paulus	Southeastern Kestrel		T	T
Grus canadensis pratensis	Florida Sandhill Crane		T	T
Haematopus palliatus	Oystercatcher			
Sterna albifrons antiilarum	Least Tern		T	T
Buteo brachyurus fuliginosus	Short-tailed Hawk			R
Vireo altiloquus	Black-whiskered Vireo			R
Ardea herodias occidentalis	Great White Heron		T	SSC
Florida caerulea	Little Blue Heron			SSC
Casmerodius albus	Great, Common Egret			SSC
Egretta thula	Snowy Egret			SSC
Hydranassa tricolor	Louisiana Heron			SSC
Nycticorax nycticorax	Yellow-crowned Night Heron			SSC
Ixobrychus exilis exilis	Least Bittern			SSC

MALCOLM PIRNIE

TABLE 2.3.6.2

VERTEBRATES POTENTIALLY INHABITING THE SITE OF THE PROPOSED BROWARD COUNTY RESOURCE RECOVERY FACILITY

Common Name	Scientific Name
MAMMALS	
Cotton Rat	Sigmodon hispidus
Cottontail Rabbit	Sylvilagus floridanus
Dog	Canis familiaris
Cat	Felis catus
Gray Squirrel	Sciurus carolinensis
Raccoon	Procyon lotor
Fox Squirrel	Sciurus niger
Oppossum	Didelphis marsupialis
Skunk	Mephitis mephitis
BIRDS	
Cattle Egret	Bubulcus ibis
Turkey Vulture	Cathartes aura
Black Vulture	Coragyps atratus
American Kestrel	Falco sparverius
Pigeon, Rock Dove	Columba livia
Mourning Dove	Zenaida macroura
Ground Dove	Columbina passerina
Killdeer	Charadrius vociferus
Meadowlark	Sternella magna
Redwing Blackbird	Agelaius phoeniceus
Common Grackle	Quiscalus quiscula
Mockingbird	Mimus polyglottos
House Sparrow	Passer domesticus
Song Sparrow	Melospiza melodia
Palm Warbler	Dendroica palmarum
Cardinal	Cardinalis cardinalis
Bobwhite Quail	Colinus virginianus
Redbellied Woodpecker	Melanerpes carolinus
Red-Shouldered Hawk	Buteo lineatus
Sea Gull	Larus argentatus
REPTILES	
Striped Mud Turtle	Kinosternon bauri
Six-lined Racerunner	Cnemidophorus sexlineatus
Skink	Eumeces sp.
Corn Snake	Elaphe g. guttata
Everglades Rat Snake	Elaphe obsoleta rossalleni
Ribbon Snake	Thamnophis sauritus sackeni
Black Snake	Coluber constrictor
AMPHIBIANS	
Eastern Spadefoot Toad	Scaphiopus holbrooki

MALCOLM PIRNIE

2.3.7 METEOROLOGY AND AMBIENT AIR QUALITY

2.3.7.1 METEOROLOGY

The meteorological and air quality data collected at existing monitoring stations were used to describe the local and regional climatology and air quality in the vicinity of the proposed plant. The closest existing meteorological station with complete meteorological data to the proposed plant is the primary National Weather Service (NWS) station in Miami, Florida, situated approximately 55 kilometers (km) south-southwest of the proposed plant site. NWS has recorded weather observations for at least the last 40 years at this site, and these data are the most complete for the region surrounding the proposed project. Existing air quality data were obtained from monitoring stations maintained and operated by the Broward County Environmental Quality Control Board (EQCB) and Florida Power and Light Company (FP&L).

Temperature

Temperature means and extremes for Miami are presented in Table 2.3-1. The climate is tropical with a large marine influence from the Atlantic Ocean and Biscayne Bay. The mean temperature varies from 67 degrees Fahrenheit (°F) in January to 83°F in August with an annual average temperature of 75.6°F. Record extreme temperatures ranged from a low of 31°F to a record high of 98°F. Although the sun's elevation is nearly zenith during the summertime, temperatures do not exceed 100°F. The reason can be attributed to the high relative humidities with subsequent cloud cover formation and the abundant convective-type precipitation.

Relative Humidity and Precipitation

Relative humidity, an indication of the amount of moisture in the air at a given temperature, is presented in Table 2.3-2 for the hours of 0100 and 0700 in the morning and 1300 and 1900 in the afternoon. The highest humidities coexist with the coolest ambient temperatures, namely at 0700 or near dawn. Similarly, the lowest humidities coincide with the highest ambient temperatures, in this case at 1300.

Table 2.3-1. Temperature Means and Extremes (°F) Measured at Miami International Airport, Miami, Florida--1951 to 1980

Month	Mean	Average Diurnal Maximum	Average Diurnal Minimum	Record Maximum*	Record Minimum*
January	67.1	75.0	59.2	87	31
February	67.8	75.8	59.7	89	32
March	71.7	79.3	64.1	92	32
April	75.3	82.4	68.2	96	46
May	78.5	85.1	71.9	94	53
June	81.0	87.3	74.6	98	65
July	82.4	86.7	76.2	98	69
August	82.8	89.2	76.5	98	68
September	81.8	87.8	75.7	95	68
October	77.9	84.2	71.6	95	51
November	72.8	79.8	65.8	89	39
December	68.5	76.2	60.8	87	33
Annual	75.6	82.6	68.7	98	31

*34-year period of record, 1943 to 1983.

Source: National Oceanic and Atmospheric Administration (NOAA), 1983.

Table 2.3-2. Precipitation and Diurnal Relative Humidity Measured at Miami, Florida

Month	Precipitation (inches)			Relative Humidity** (%) hour (LT)			
	Mean*	Maximum†	Minimum†	0100	0700	1300	1900
January	2.08	6.66	0.04	80	84	60	69
February	2.05	8.07	0.01	79	83	57	66
March	1.89	7.22	0.02	77	82	57	65
April	3.07	17.29	0.07	75	79	55	64
May	6.53	18.54	0.44	79	81	60	70
June	9.15	22.36	1.81	84	86	66	75
July	5.98	13.51	1.77	82	85	63	72
August	7.02	16.88	1.65	83	87	66	74
September	8.07	24.40	2.63	85	89	67	77
October	7.14	21.08	1.50	83	87	64	73
November	2.71	13.15	0.09	81	85	61	71
December	1.86	6.39	0.13	79	83	59	70
Annual	57.55	89.33	37.00	81	84	61	70

*1951-1980.
†1943-1983.
**1965-1983.

Source: NOAA, 1983.

Over 75 percent of the annual precipitation falls during the six warmest months, May through October. The mean annual precipitation is 58 inches, but this has varied from as little as 37 inches to over 89 inches in the last 30 years. The majority of rain is in the form of short-lived convection showers. Precipitation means and extremes are also presented in Table 2.3-2.

Severe Storms

Thunderstorms are the most frequent of severe storms, occurring an average of 75 days per year. These storms occur throughout the year, but nearly 75 percent occur from May through October.

Tropical cyclones, and more specifically hurricanes, have invaded the Miami area coastline infrequently since the 1960s, but always remain a threat in any given year. According to statistics compiled by Simpson and Lawrence (1971), the probability that a tropical cyclone will enter the 50-mile coastal stretch from South Miami to Pompano Beach any given year is 20 percent, with a 16-percent chance that it will be of hurricane intensity, and only a 7 percent chance that its maximum winds will exceed 124 miles per hour (mph), that of a great hurricane. Tropical cyclones usually approach Miami from early August to late October.

Statistics copmpiled by the Severe Local Storms (SELS) branch of the National Severe Storms Forecast Center (Pautz, 1969) show that 25 tornadoes (or waterspouts) were spotted within the 1° latitude by 1° longitude square centered just south and west of Miami from 1955 to 1967. This averages approximately 1.9 tornadoes per year. The tornado recurrence interval for any specific point location within the 1° square is estimated by a methodology of Thom (1963) to be 802 years. Therefore, the mean recurrence interval for a tornado striking a point within this square is 802 years. The most common tornado month is June.

Mixing Depths

The monthly and average mixing depths for Miami as estimated by Holzworth are listed in Table 2.3-3. The highest afternoon mixing depths occur in the spring, and the lowest morning depths occur in mid-winter. The mean high humidity and low-level cloudiness prevent mean mixing depths subsidence below 500 meters (m).

Atmospheric Stability

Monthly and annual frequencies of Pasquill's stability classes are shown in Table 2.3-4. Frequent and strong sea breezes cause a predominance of neutral and stable air (D and E stabilities), counteracting the effect of high incidence of sunshine over urban Miami. The joint frequency of wind per stability class is given in Table 2.3-5. As can be seen, there is a large easterly component of wind under neutral and stable air masses.

Wind Patterns

A combination of easterly trade winds superimposed on frequent easterly (onshore) sea breezes gives Miami a large dominance of easterly winds. During several months, easterly winds prevailed over 25 percent of the time, and in an annual period, almost 19 percent of the time.
Figure 2.3-1 presents monthly and annual wind roses for the 6-year period from 1969 to 1974.

2.3.7.2 AMBIENT AIR QUALITY

A listing of all the ambient monitoring locations in Broward County is presented in Table 2.3-6. There are currently 18 sites operated by Broward County and 3 sites operated by FP&L. Based on the Prevention of Significant Deterioration (PSD) monitoring guidelines (EPA, 1981), for a proposed source located in an area of multisource emissions and flat terrain, existing ambient monitoring data may be acceptable if the existing monitor is within 10 km of the proposed source or 1 km of predicted maximum impacts.

Table 2.3-3. Mean Diurnal Mixing Depths* at Miami International Airport, Miami, Florida

Month	Mean Diurnal Mixing Depth (m)	
	Morning	Afternoon
January	666	1,145
February	676	1,242
March	900	1,406
April	1,039	1,435
May	997	1,483
June	1,020	1,309
July	1,065	1,392
August	1,032	1,364
September	957	1,312
October	814	1,371
November	853	1,267
December	623	1,258
Annual	878†	1,330†

*5-year averaged data, 1960-1964.
†True weighted averages.

Source: Holzworth, 1972.

MALCOLM PIRNIE

Table 2.3-4. Frequency of Occurrence of Pasquill's Stabilities for Miami, Florida--1969 to 1974

Month	Pasquill's Stability Class (%)				
	A	B	C	D	E
January	0.0	2.9	10.3	44.1	42.7
February	0.0	2.3	8.5	52.6	36.6
March	0.0	2.1	8.5	53.2	36.3
April	0.1	4.4	12.6	50.8	32.1
May	0.3	5.2	19.0	47.9	27.6
June	0.3	11.5	19.9	32.8	35.5
July	0.3	12.8	23.0	24.3	39.5
August	0.5	9.1	20.4	31.6	38.5
September	0.2	5.7	12.2	37.4	44.5
October	0.0	4.7	8.2	46.6	40.5
November	0.0	1.7	9.8	46.7	41.9
December	0.0	1.7	10.1	42.6	45.5
Annual	0.1	5.4	13.7	42.0	38.6

Source: NOAA, 1974.

Table 2.3-5. Joint Frequency Distribution of Wind and Pasquill Stability Class
Miami, Florida, 1969 through 1974

SPEED(KTS)

DIRECTION	0 - 3	4- 6.	7 - 10	11 - 16	17 - 21	GREATER THAN 21	TOTAL
N	0.000007	0.000057	0.0	0.0	0.0	0.0	0.000064
NNE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ENE	0.000007	0.000057	0.0	0.0	0.0	0.0	0.000064
E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ESE	0.000007	0.000057	0.0	0.0	0.0	0.0	0.000064
SE	0.000037	0.000285	0.0	0.0	0.0	0.0	0.000322
SSE	0.000079	0.000114	0.0	0.0	0.0	0.0	0.000193
S	0.000072	0.000057	0.0	0.0	0.0	0.0	0.000129
SSW	0.000079	0.000114	0.0	0.0	0.0	0.0	0.000193
SW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WSW	0.000015	0.000114	0.0	0.0	0.0	0.0	0.000129
W	0.000151	0.000171	0.0	0.0	0.0	0.0	0.000322
WNW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NNW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.000456	0.001027	0.0	0.0	0.0	0.0	

RELATIVE FREQUENCY OF OCCURRENCE OF A STABILITY = 0.001483

RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH A STABILITY = 0.000171

MALCOLM PIRNIE

Table 2.3-5. Joint Frequency Distribution of Wind and Pasquill Stability Class
Miami, Florida, 1969 through 1974 (Continued, Page 2 of 6)

SPEED(KTS)

DIRECTION	0 - 3	4- 6.	7 - 10	11 - 16	17 - 21	GREATER THAN 21	TOTAL
N	0.001335	0.002225	0.000970	0.0	0.0	0.0	0.004530
NNE	0.000664	0.000970	0.000513	0.0	0.0	0.0	0.002148
NE	0.000240	0.000285	0.000342	0.0	0.0	0.0	0.000868
ENE	0.000314	0.000970	0.000742	0.0	0.0	0.0	0.002026
E	0.000621	0.001654	0.001997	0.0	0.0	0.0	0.004273
ESE	0.000584	0.002567	0.003537	0.0	0.0	0.0	0.006689
SE	0.000715	0.003195	0.003195	0.0	0.0	0.0	0.007105
SSE	0.000694	0.002282	0.001654	0.0	0.0	0.0	0.004631
S	0.000631	0.002054	0.001483	0.0	0.0	0.0	0.004168
SSW	0.000614	0.001312	0.000285	0.0	0.0	0.0	0.002211
SW	0.000599	0.000685	0.000171	0.0	0.0	0.0	0.001455
WSW	0.000667	0.001084	0.000799	0.0	0.0	0.0	0.002549
W	0.000965	0.001369	0.001255	0.0	0.0	0.0	0.003589
WNW	0.000723	0.000970	0.000513	0.0	0.0	0.0	0.002206
NW	0.001189	0.000970	0.000513	0.0	0.0	0.0	0.002673
NNW	0.001425	0.001084	0.000913	0.0	0.0	0.0	0.003422
TOTAL	0.011981	0.023676	0.018884	0.0	0.0	0.0	

RELATIVE FREQUENCY OF OCCURRENCE OF B STABILITY = 0.054541

RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH B STABILITY = 0.000799

Table 2.3-5. Joint Frequency Distribution of Wind and Pasquill Stability Class
Miami, Florida, 1969 through 1974 (Continued, Page 3 of 6)

SPEED(KTS)

DIRECTION	0 - 3	4- 6,	7 - 10	11 - 16	17 - 21	GREATER THAN 21	TOTAL
N	0,000210	0,003594	0,008957	0,009299	0,000628	0,000114	0,022803
NNE	0,000076	0,001769	0,003822	0,006276	0,001883	0,000228	0,014054
NE	0,000004	0,000399	0,006675	0,015290	0,002453	0,000399	0,025221
ENE	0,000014	0,001312	0,012380	0,026415	0,003138	0,000228	0,043487
E	0,000319	0,002967	0,031378	0,058079	0,006219	0,000571	0,099532
ESE	0,000087	0,002796	0,020938	0,031949	0,002453	0,0	0,058222
SE	0,000266	0,003423	0,012038	0,015689	0,000628	0,0	0,032044
SSE	0,000079	0,002054	0,007987	0,007702	0,000228	0,0	0,018050
S	0,000262	0,002967	0,007303	0,006960	0,001084	0,000114	0,018689
SSW	0,000254	0,002282	0,003081	0,003138	0,000571	0,000114	0,009440
SW	0,000127	0,001141	0,003252	0,002910	0,000628	0,000057	0,008114
WSW	0,000303	0,001369	0,002910	0,004678	0,000513	0,000171	0,009944
W	0,000656	0,002054	0,003309	0,003024	0,000799	0,000171	0,010012
WNW	0,000192	0,001826	0,003937	0,003880	0,000628	0,000114	0,010575
NW	0,000253	0,002168	0,006333	0,007645	0,001883	0,000057	0,018339
NNW	0,000149	0,003252	0,006789	0,009870	0,001940	0,000057	0,022057
TOTAL	0,003252	0,035372	0,141088	0,212802	0,025673	0,002396	

RELATIVE FREQUENCY OF OCCURRENCE OF D STABILITY = 0,420584

RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH D STABILITY = 0,000399

Table 2.3-5. Joint Frequency Distribution of Wind and Pasquill Stability Class Miami, Florida, 1969 through 1974 (Continued, Page 4 of 6)

SPEED(KTS)

DIRECTION	0 - 3	4- 6,	7 - 10	11 - 16	17 - 21	GREATER THAN 21	TOTAL
N	0.000382	0.003138	0.004906	0.000513	0.0	0.0	0.008940
NNE	0.000267	0.001141	0.001597	0.000342	0.000057	0.0	0.003405
NE	0.000138	0.000742	0.002624	0.000856	0.0	0.0	0.004360
ENE	0.000031	0.001084	0.004564	0.002624	0.000114	0.0	0.008417
E	0.000302	0.002396	0.012894	0.006504	0.000171	0.0	0.022267
ESE	0.000343	0.001769	0.014833	0.005078	0.000228	0.0	0.022251
SE	0.000240	0.002282	0.012323	0.003081	0.000057	0.0	0.017983
SSE	0.000395	0.001540	0.006789	0.001826	0.000057	0.0	0.010608
S	0.000462	0.001826	0.004279	0.001027	0.000171	0.0	0.007765
SSW	0.000195	0.000685	0.001597	0.000399	0.0	0.0	0.002877
SW	0.000232	0.001997	0.001597	0.000342	0.000171	0.0	0.004340
WSW	0.000208	0.001141	0.001826	0.000285	0.000057	0.000057	0.003574
W	0.000749	0.001597	0.001769	0.000571	0.0	0.0	0.004686
WNW	0.000381	0.001027	0.002681	0.000628	0.0	0.0	0.004717
NW	0.000689	0.001540	0.001997	0.000513	0.000114	0.0	0.004853
NNW	0.000519	0.001769	0.003423	0.000399	0.000057	0.0	0.006167
TOTAL	0.005534	0.025673	0.079701	0.024989	0.001255	0.000057	

RELATIVE FREQUENCY OF OCCURRENCE OF C STABILITY = 0.137209

RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH C STABILITY = 0.000856

MALCOLM PIRNIE

Table 2.3-5. Joint Frequency Distribution of Wind and Pasquill Stability Class
Miami, Florida, 1969 through 1974 (Continued, Page 5 of 6)

MALCOLM PIRNIE

SPEED(KTS)

DIRECTION	0 - 3	4 - 6,	7 - 10	11 - 16	17 - 21	GREATER THAN 21	TOTAL
N	0.007391	0.021680	0.007588	0.0	0.0	0.0	0.036658
NNE	0.001588	0.005591	0.002168	0.0	0.0	0.0	0.009347
NE	0.000476	0.004507	0.003937	0.0	0.0	0.0	0.008920
ENE	0.001443	0.009414	0.011239	0.0	0.0	0.0	0.022096
E	0.004631	0.031321	0.026700	0.0	0.0	0.0	0.062652
ESE	0.004176	0.021394	0.010497	0.0	0.0	0.0	0.036067
SE	0.005349	0.015119	0.005762	0.0	0.0	0.0	0.026230
SSE	0.005350	0.010669	0.002396	0.0	0.0	0.0	0.018414
S	0.007115	0.016260	0.002282	0.0	0.0	0.0	0.025657
SSW	0.003625	0.009071	0.001312	0.0	0.0	0.0	0.014008
SW	0.002920	0.007759	0.001883	0.0	0.0	0.0	0.012562
WSW	0.003077	0.008729	0.002396	0.0	0.0	0.0	0.014202
W	0.005131	0.011125	0.002054	0.0	0.0	0.0	0.018309
WNW	0.006123	0.010726	0.002453	0.0	0.0	0.0	0.019302
NW	0.006698	0.016203	0.004906	0.0	0.0	0.0	0.027807
NNW	0.007192	0.019683	0.007074	0.0	0.0	0.0	0.033950
TOTAL	0.072284	0.219249	0.094648	0.0	0.0	0.0	

RELATIVE FREQUENCY OF OCCURRENCE OF E STABILITY = 0.386182

RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH E STABILITY = 0.011182

Table 2.3-5. Joint Frequency Distribution of Wind and Pasquill Stability Class
Miami, Florida, 1969 through 1974 (Continued, Page 6 of 6)

MALCOLM PIRNIE

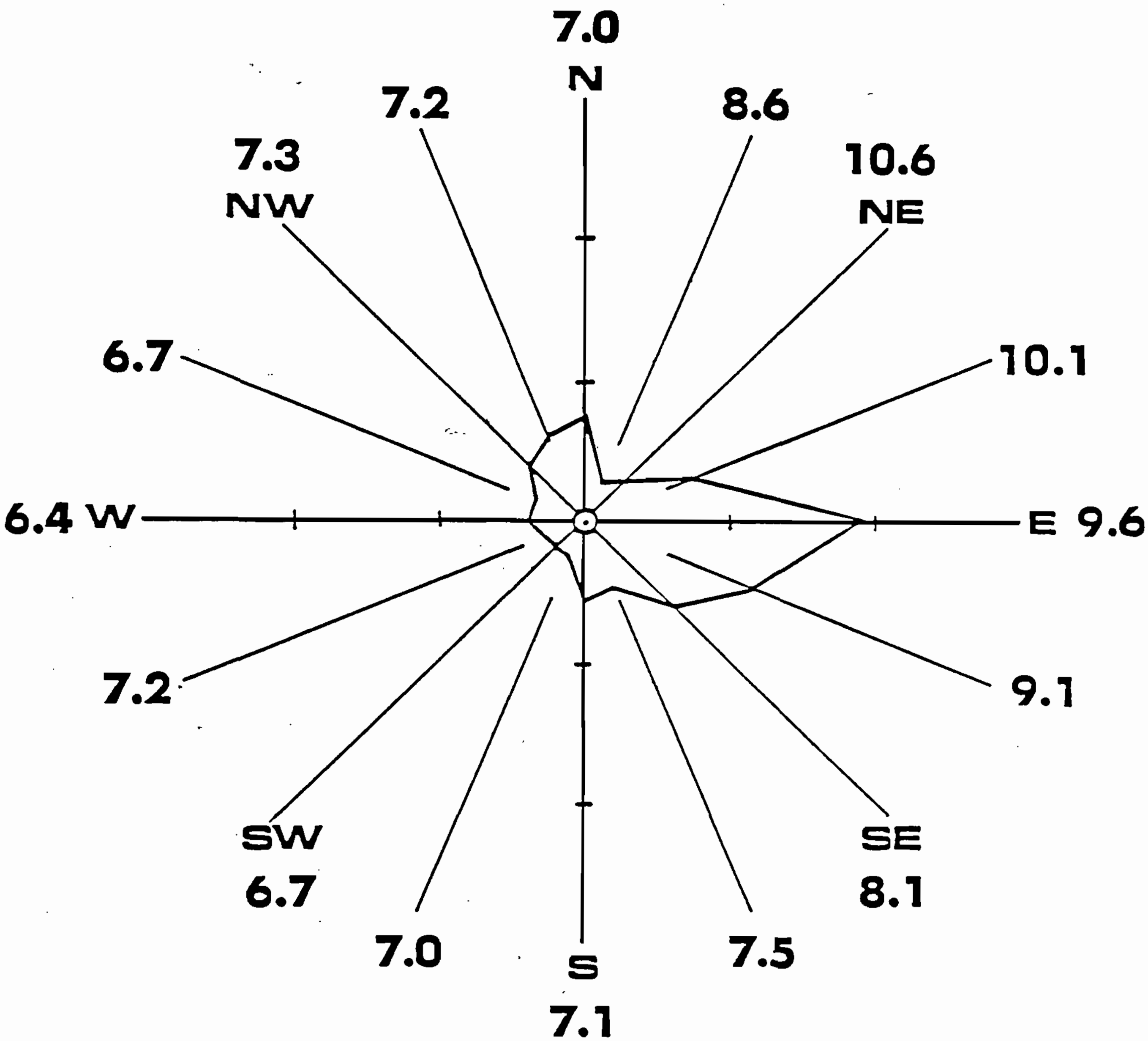
SPEED(KTS)

DIRECTION	0 - 3	4- 6,	7 - 10	11 - 16	17 - 21	GREATER THAN 21	TOTAL
N	0.009334	0.030694	0.022421	0.009813	0.000628	0.000114	0.073003
NNE	0.002632	0.009471	0.008101	0.006618	0.001940	0.000228	0.028990
NE	0.000856	0.005933	0.013578	0.016146	0.002453	0.000399	0.039366
ENE	0.001805	0.012837	0.028925	0.029039	0.003252	0.000228	0.076086
E	0.005822	0.038339	0.072969	0.064582	0.006390	0.000571	0.188672
ESE	0.005187	0.028583	0.049806	0.037026	0.002681	0.0	0.123283
SE	0.006632	0.024304	0.033318	0.018770	0.000685	0.0	0.083708
SSE	0.006602	0.016659	0.018827	0.009528	0.000285	0.0	0.051901
S	0.008540	0.023163	0.015347	0.007987	0.001255	0.000114	0.056407
SSW	0.004779	0.013464	0.006276	0.003537	0.000571	0.000114	0.028740
SW	0.003886	0.011581	0.006903	0.003252	0.000799	0.000057	0.026479
WSW	0.004270	0.012437	0.007930	0.004963	0.000571	0.000228	0.030400
W	0.007653	0.016317	0.008387	0.003594	0.000799	0.000171	0.036920
WNW	0.007414	0.014548	0.009585	0.004507	0.000628	0.000114	0.036795
NW	0.008815	0.020881	0.013749	0.008158	0.001997	0.000057	0.053658
NNW	0.009281	0.025787	0.018199	0.010269	0.001997	0.000057	0.065591
TOTAL	0.093507	0.304997	0.334322	0.237791	0.026928	0.002453	

TOTAL RELATIVE FREQUENCY OF OBSERVATIONS = 1.000000

TOTAL RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE = 0.013407

Source: NOAA, 1974.



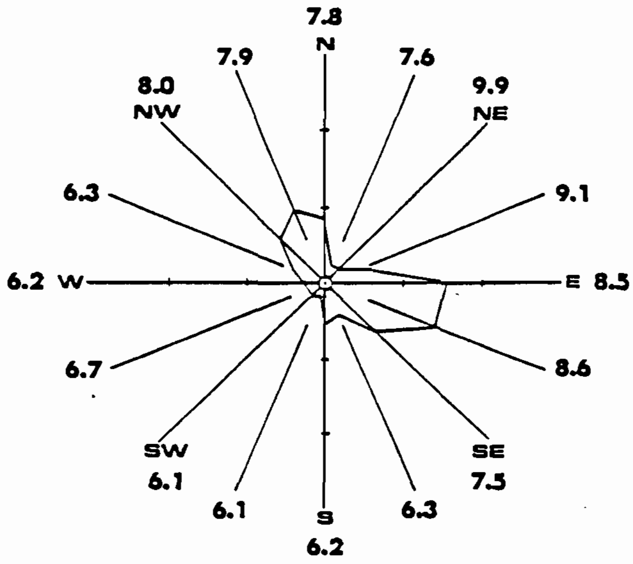
ANNUAL

CALM - 1.3 %

NOTE: SCALE IS MARKED IN INCREMENTS OF 10 PERCENT.
AVERAGE SPEEDS ARE GIVEN IN KNOTS

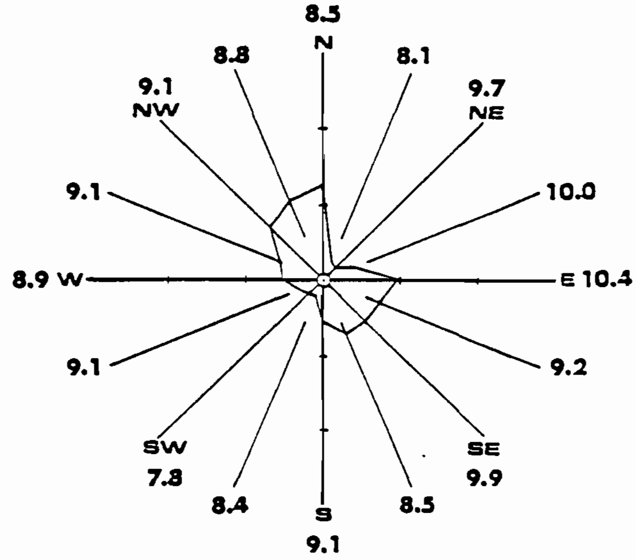
SOURCE: NOAA, 1974.

AVERAGE MONTHLY AND ANNUAL WIND ROSES FOR MIAMI, FLORIDA 1969-1974



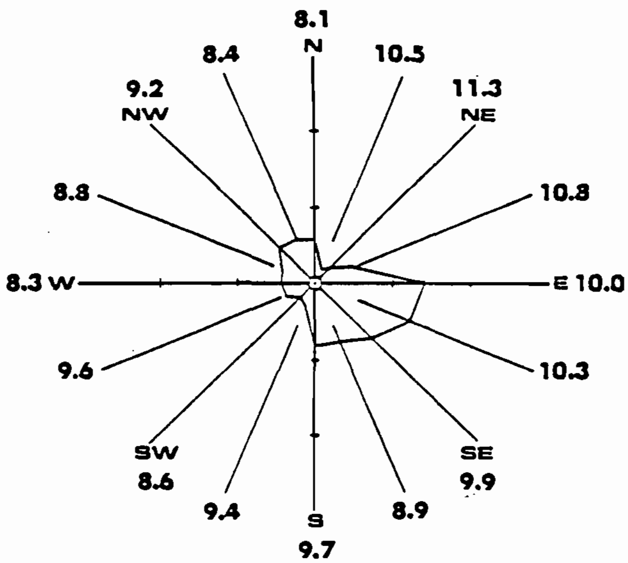
JANUARY

CALM - 1.4%



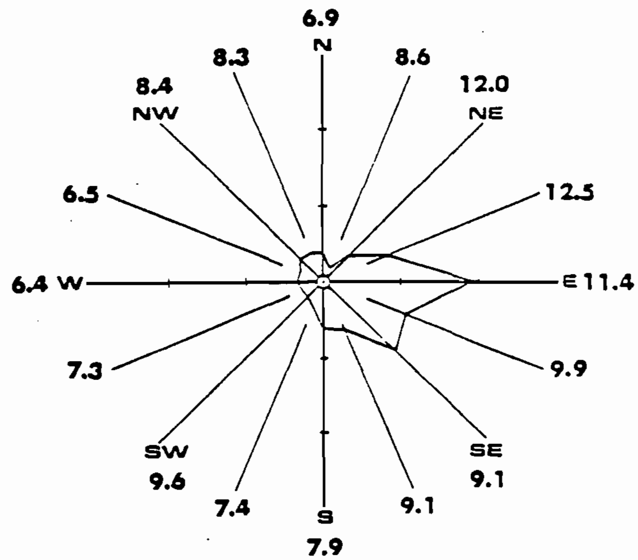
FEBRUARY

CALM - 0.4%



MARCH

CALM - 0.5%



APRIL

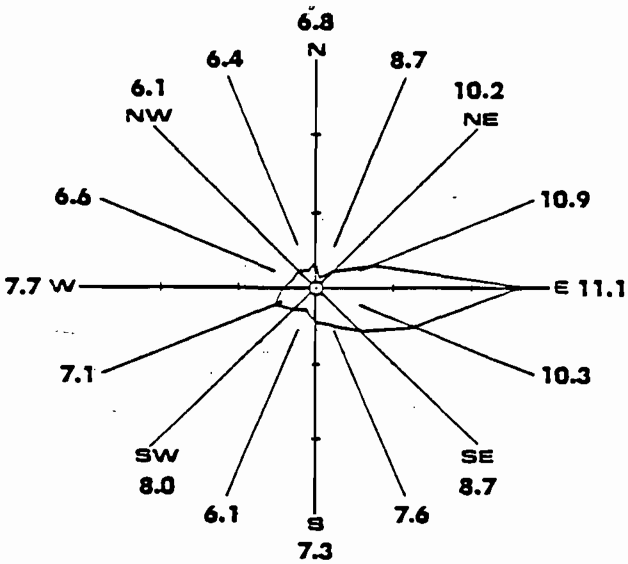
CALM - 0.1%

NOTE: SCALE IS MARKED IN INCREMENTS OF 10 PERCENT.
AVERAGE SPEEDS ARE GIVEN IN KNOTS

(PAGE 2 OF 4)

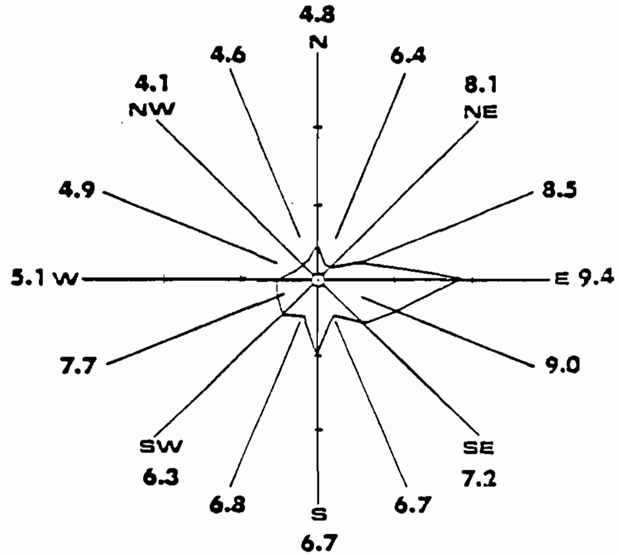
SOURCE: NOAA, 1974.

**AVERAGE MONTHLY AND ANNUAL WIND ROSES
FOR MIAMI, FLORIDA
1969-1974**



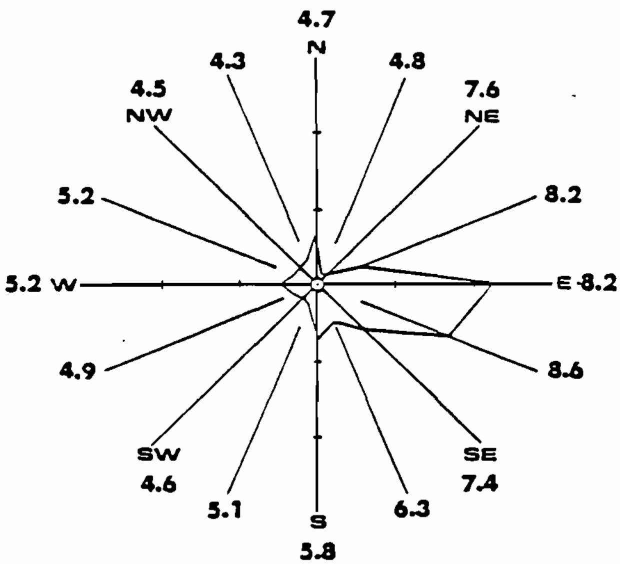
MAY

CALM - 0.7%



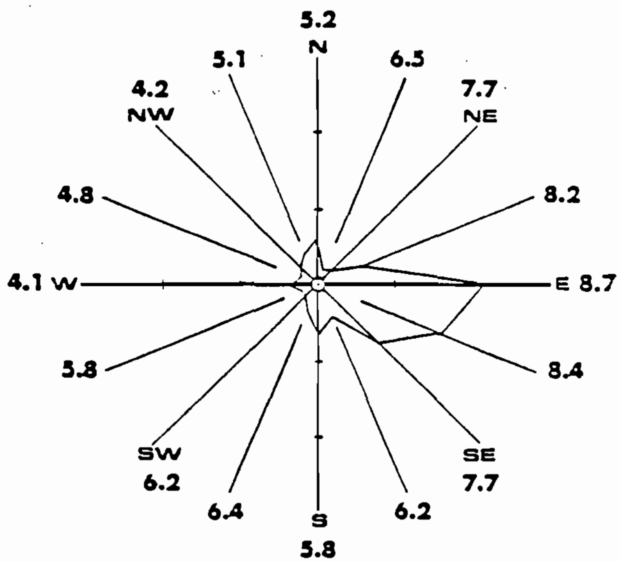
JUNE

CALM - 2.4%



JULY

CALM - 2.6%



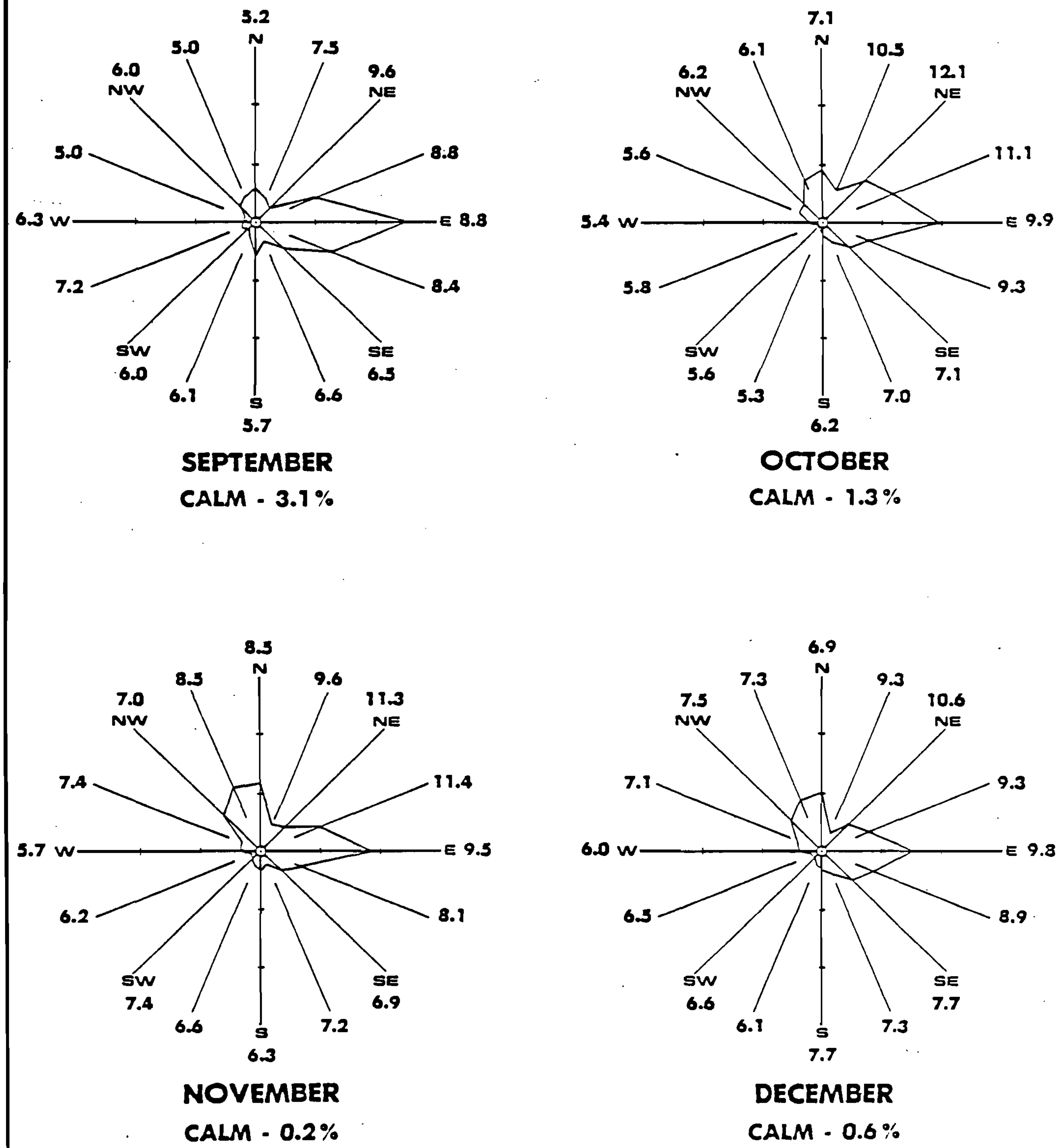
AUGUST

CALM - 2.7%

NOTE: SCALE IS MARKED IN INCREMENTS OF 10 PERCENT.
AVERAGE SPEEDS ARE GIVEN IN KNOTS

SOURCE: NOAA, 1974.

AVERAGE MONTHLY AND ANNUAL WIND ROSES FOR MIAMI, FLORIDA 1969-1974



NOTE: SCALE IS MARKED IN INCREMENTS OF 10 PERCENT.
AVERAGE SPEEDS ARE GIVEN IN KNOTS

(PAGE 4 OF 4)

SOURCE: NOAA, 1974.

AVERAGE MONTHLY AND ANNUAL WIND ROSES FOR MIAMI, FLORIDA 1969-1974

MALCOLM PIRNIE

Table 2.3-6. Ambient Air Monitoring Sites in Broward County During 1984

SAROAD No.	Broward County No. or Operator	Location: City/Division	Location: UTM, X,Y Coordinates (km)	Pollutant Measured	Location with Respect to Proposed Facility: Direction (°)	Location with Respect to Proposed Facility: Distance (km)
3700003G01	1	Pompano Beach	590.17, 2908.00	TSP, Pb	85	6.2
3700002G01	3	Pompano Beach	587.85, 2902.78	TSP	14	6.1
2270001G01/09	4	Lauderdale Lakes	579.55, 2894.76	TSP, NO_2, SO_2, CO	199	13.5
3640002G01	5	Plantation	575.52, 2891.27	TSP	208	18.3
1260003G01	6	Ft. Lauderdale	583.11, 2890.09	TSP, NO_2, SO_2, CO, Pb	183	17.4
4350001G01	7	Tamarac	574.44, 2897.87	TSP	225	13.6
0910002G01	8	Davie	576.19, 2884.99	TSP, NO_2, SO_2	199	23.8
3530001G01	9	Pembroke Pines	575.26, 2877.44	NO_2, SO_2	196	31.3
1840001G01	10	Hollywood	582.21, 2876.98	TSP, Pb	183	30.6
1640001G01	11	Hallandale	584.60, 2874.44	TSP	179	33.1
1260004G01/09	12	Ft. Lauderdale	585.20, 2887.20	TSP, NO_2, SO_2	177	20.3
0420002G01	13	Hacienda Village	579.70, 2885.34	CO	191	22.6
0420003G03	14	Coral Springs	571.60, 2906.88	O_3	267	12.4
3530002G01/09	15	Pembroke Pines	570.00, 2878.40	TSP	206	32.3

MALCOLM PIRNIE

Table 2.3-6. Ambient Air Monitoring Sites in Broward County During 1984 (Continued, Page 2 of 2)

SAROAD No.	Broward County No. or Operator	Location: City/Division	Location: UTM, X,Y Coordinates (km)	Pollutant Measured	Location with Respect to Proposed Facility: Direction (°)	Location with Respect to Proposed Facility: Distance (km)
0420004G01	16	N. Lauderdale	577.73, 2900.11	O_3	220	9.7
3700004G01	17	Pompano Beach	585.34, 2900.13	CO	170	7.5
1840002G01	18	Hollywood	584.00, 2875.87	CO	180	31.6
2560002G01	19	Margate	578.86, 2903.51	TSP, Pb	232	6.5
1260005J02	FP&L	Ft. Lauderdale	579.28, 2882.35	TSP, NO_2, SO_2	191	25.6
1260006J02	FP&L	Ft. Lauderdale	583.05, 2883.85	TSP, NO_2, SO_2	182	23.7
1260007J02	FP&L	Ft. Lauderdale	589.10, 2886.85	TSP, NO_2, SO_2	166	21.3

Source: ESE, 1986.

The existing monitoring sites located within 10 km of the facility are listed in Table 2.3-7. The maximum concentrations measured during 1984 are also presented in this table. Based on these measured maximum concentrations, pollutant concentrations within a 10-km radius from the facility are less than the national and Florida Ambient Air Quality Standards (AAQS). Although Broward County Monitoring Site No. 4 is 13.5 km from the proposed facility site, concentrations from the monitor are included since it is the closest site with SO_2 and NO_2 concentrations. It should be noted that the SO_2 and NO_2 concentrations are not measured by an acceptable technique for use in PSD applications. However, based on the data presented in Table 2.3-7, the measured SO_2 and NO_2 concentrations are well below AAQS.

2.3.7.3 MEASUREMENT PROGRAMS

All information (i.e., meteorology and air quality data) was compiled from offsite monitoirng stations maintained and operating by cooperating governmental agencies. Ambient air quality data were obtained from the Broward County EQCB and FP&L which operate a total of 21 monitoring stations throughout the county. No significant changes in these programs are anticipated after plant operation has begun.

Meteorological data were obtained from the NWS station in Miami. These include both surface- and upper-air data from which a 6-year (i.e., 1969 through 1974) average of the joint frequency of wind direction, wind speed, and atmospheric stability and a 5-year (i.e., 1960 through 1964) average of mixing heights were developed. Since 1957, the observing NWS station at Miami has been located 7 feet above mean sea level (msl) with wind sensors located 23 feet above grade. Regular surface observations are taken just before each hour, 7 days per week. Upper-air soundings are conducted twice per day at 0700 and 1900 Eastern Standard Time.

The Environmental Protection Agency (EPA)- and Department of Environmental Regulation (DER)-approved Industrial Source Complex Short-Term (ISCST) model were used to predict the maximum air quality impacts

Table 2.3-7. 1984 Ambient Air Quality Data for Monitoring Stations Within 10 km of the North Broward County Resource Recovery (NBCRR) Facility

Broward County No. or Operator	SAROAD No.	Concentration (ug/m^3)*								
		TSP		SO_2		NO_2	CO†		Pb	O_3
		24-hr	Annual	24-hr	Annual	Annual	1-hr	8-hr	Quarter	1-hr
1	3700003G01	63	36	—	—	—	—	—	0.2**	—
3	3700002G01	120**	48**	—	—	—	—	—	—	—
4	2270001G01	76	38	6**	3**	33**	7	5	—	—
—	2270001G09	76	38	12**	6**	34**	—	—	—	—
16	0420003G03	—	—	—	—	—	—	—	—	202**
17	3700004G01	—	—	—	—	—	7**	5**	—	—
19	2560002G01	59	29	—	—	—	—	—	0.1**	—
Florida AAQS		150	60	260	60	100	40	10	1.5	235

*For short-term averages, second-highest concentration is shown.
†CO concentrations in mg/m^3.
**Closest monitoring station for specified pollutant.

Notes: TSP = total suspended particulate.
SO_2 = sulfur dioxide.
NO_2 = nitrogen dioxide.
CO = carbon monoxide.
Pb = lead.
O_3 = ozone.

Source: ESE, 1986.

MALCOLM PIRNIE

TABLE 3.4.4.1

ENVIRONMENTAL DATA

Air Pollution Control Equipment
(Electrostatic Precipitators)

Four (4) electrostatic precipitators, arranged for outdoor installation, each containing three electrical fields.

Design

Volume (lb/hr at operating conditions)	367,330
Temperature (°F at design conditions)	660
Gas velocity ft/sec	2.35 to 2.90
Maximum outlet dust burden	0.02 grains/dscf corrected to 12% CO_2

A comparison with pre- and post-construction is presented in Table 3.5.1. Temporary shutdowns of the plant would result only in potable and sanitary water flow (5 gpm) and service water flow (5 gpm). Upon abandonment, no water flows would occur.

No water data will be required by the South Florida Water Management District (SFWMD) for this project because the Broward County Utilities Division (BCUD) will supply all water requirements and treat all wastewaters prior to ocean outfall discharge.

2.3.8 Noise

A technical noise analysis was performed for this application and is contained in Appendix 10.10. Existing ambient source levels were recorded at separate locations along the perimeter and within the site itself. Figure 2.3.8.1 identifies the approximate location of the sampling points.

The maximum dBA level recorded during the survey and the added combined noise level for each location is presented in Table 2.3.8.1. These levels are in decibels (dB(A)). The higher the decibel level the louder the sound.

The land use designation for the area immediately surrounding the proposed site is industrial. The Broward County Code of Regulations sets the sound limit for industrial zoning at 70 dB(A). Therefore, as shown in Table 2.3.8.1 the ambient noise levels do not exceed the County sound level limits at the boundaries.

2.3.9 Other Environmental Features

All environmental features of the Project site have been addressed fully in preceding sub-sections of Section 2. No additional environmental evaluation of the site or site environs is required.

TABLE 2.3.8.1

AMBIENT NOISE
MAXIMUM RECORDED AND COMBINED, dBA

Point	Maximum	Combined
1	61	61.4
2	61	61.6
3	59	59.5
4	59	59.5
5	58	58.6
6	58	58.6
7	56	57.2
8	65	65.5
9	56	56.6

SECTION 3

THE PLANT AND DIRECTLY ASSOCIATED FACILITIES

3.1 Background

3.1.1 Technology Selection

As previously mentioned in Section 1, a policy decision was made in 1982 by Broward County not to rely on landfill as a primary, long-term disposal solution, and to concentrate on alternatives that involve the recovery of materials and/or energy. The decision to build a resource recovery (waste-to-energy) system came after years of investigation by the County into other methods for waste disposal. These investigations have included the evaluation of the following technologies:

- o Materials Recovery
- o Composting
- o Energy Recovery
  - Solid, Gaseous and Liquid Refuse Derived Fuel (RDF) Combustion Systems
  - Mass Burning Incineration

The following subsections summarize the evaluation results with respect to each of the above listed technologies.

Materials Recovery

Materials recovery encompasses methods and procedures for extracting useful materials from solid waste for return to the economy. It generally involves the mechanical separation of the solid waste constituents through use of the following equipment:

- o Size Reduction Equipment (shredders, crushers, shear mills, etc.)
- o Air Classifiers (rotary drums, air knives, horizontal air separators, etc.)

MALCOLM PIRNIE

- o Trommel Screens
- o Magnetic Separators
- o Glass and Aluminum Separators
(heavy media separators, aluminum magnets, froth flotation units, optical sorters, etc.)
- o Miscellaneous Separation Processes
(vibrating screens, hand sorting, etc.)

The abrasive heterogenous nature of solid waste makes it difficult to handle, and can subject the above listed mechanical equipment to excessive wear. The potential for explosions also exists. In addition, the current marketability of recovered solid waste materials is not sufficient to offset the high capital, operating and maintenance cost requirements of materials recovery systems where constructed exclusively for that purpose.

Composting

Composting is the decomposition of organic material by the action of aerobic microorganisms at temperatures in excess of 60°C. The basic concept of composting, whereby organic wastes are converted to stable humus, theoretically free of pathogens and suitable for return to the environment, appears to be attractive. This concept indicates that compost product may provide a useful resource for Broward County soils.

In the United States, the composting of sewage sludge and/or vegetative matter has attained a certain degree of success. The composting of solid waste, however, has experienced numerous difficulties. At present, there are only four solid waste composting facilities operating in the United States, and two of these add sludge to the solid waste prior to the composting process. All four facilities are operating at a capacity substantially less than that required for Broward County, and three of them have been unable to develop long term market arrangements for their final compost product.

In addition, the preprocessing of solid waste required to perform the compost process involves operation and maintenance problems similar to those encountered with material recovery systems (jamming, blockage and explosions in the equipment process train).

As a result of the above observations, in particular the fact that solid waste composting has never been demonstrated in the United States on a scale comparable to Broward County, this technology was deemed inappropriate for Broward County.

Energy Recovery

Energy recovery from solid waste can have many forms, including generation of useful energy by directly incinerating as-received, unprepared solid waste in furnaces equipped with boilers (mass burning incineration) and conversion of solid waste to various types of Refuse Derived Fuels (RDF) which in turn can be fired in furnaces equipped with boilers (RDF combustion).

RDF Combustion Systems - These systems involve the physical or biological processing of solid waste to produce a solid, liquid or gaseous fuel which can subsequently be used in boilers or furnaces.

RDF can be produced in a solid, liquid, or gaseous form depending upon the method utilized to process the raw solid waste. Shredding, air classification and/or screening can be utilized to produce a solid RDF which can be incinerated as is or densified into briquets or pellets. Processes such as pyrolysis (heating in an oxygen deficient atmosphere) or anaerobic digestion can transform the organic fraction of solid waste into a gaseous or liquid fuel.

There have been a number of solid RDF systems introduced in the 1970's that have failed as a result of both technological and economic reasons. Most of these systems experienced serious problems with solid waste shredding operations, various steps of materials separation and storage of the RDF. In addition, the RDF produced at these facilities has not been of a sufficient quality to enable successful marketing of the product. These problems have not been totally resolved to date and, therefore, represent a major setback to the successful demonstration of any full-scale municipal RDF operation.

Gaseous or liquid RDF systems generally involve solid waste processing equipment similar to that required for solid RDF systems. This equipment is subject to the same operational problems of excessive wear and explosion potential as previously discussed under solid RDF systems. In addition, gaseous and liquid RDF technology is more complex, and requires substantially higher capital costs. Although numerous processes have been developed in laboratory studies and pilot plants, none have been operational on a scale appropriate to Broward County.

Mass Burning Incineration - This technology involves the recovery of steam and/or electricity through utilization of convection (waste heat) or radiation (waterwall) boilers. These systems can consist of large field erected incinerators, or be constructed with a series of modular prefabricated incineration units.

Mass burning incineration of unprocessed solid waste, combined with heat recovery is currently the most developed and widely practiced resource recovery technique in the world. Efficient energy recovery, reduction of original waste volume and quality of ash residue are among the major assets of this technology. There are numerous mass burning stoker-fired incineration facilities in the United States, Canada, Europe and Japan that have successfully demonstrated this technology. Additional advantages of this technology include:

- Relatively high systems on-line reliability
- High thermodynamic efficiency
- Available in proprietary and non-proprietary system designs

- High volume reduction (10 percent) of input solid waste to be landfilled as ash residue

- Marketable energy products

- Adaptable to sewage sludge disposal

Modular Prefabricated Incinerators - Recent developments have occurred in the field of mass burning modular prefabricated incinerators. There are numerous domestic manufacturers that currently market various modular incineration systems based upon differing combustion processes. These systems require significantly less capital expenditures than the aforementioned field erected stoker- fired systems. These systems, however, have been operational only since 1977 and the majority of the operating facilities have capacities less than 100 tons per day. At present, there are no operating modular incineration systems with capacity greater than 360 tons per day nor are these facilities producing electricity.

The technical feasibility of modular incineration has therefore not been demonstrated for the capacity required for a Broward County facility. Since only proven technologies were contemplated for Broward County, modular mass burning incinerators were eliminated from further consideration.

Mass Burning Stoker-Fired Incineration Systems - This type of technology wherein waste is incinerated on stokers or grate systems in large furnace/boilers appear to represent the most viable technology available to Broward County for implementation under the proposed project. The major reasons for this recommendation are:

- Mass burning systems firing as-received solid waste, rank the highest in technological development and demonstrated performance.

- Mass burning systems firing as-received solid waste, rank the highest in demonstrated reliability.

- Mass burning systems can generate either steam or electricity which is highly marketable.

- Capital and operating and maintenance costs associated with mass burning systems are competitive with alternative solid waste processing systems.

- To date, mass burning constitutes the only resource recovery system operating successfully at a scale similar to Broward County.

As a result, this technology was selected by Broward County for use in implementing its resource recovery project.

3.1.2 Site Selection

Details with regard to the site selection process are presented in Section 8.1, Alternative Sites. Presented below are the salient aspects of that process. The first step involved the identification of five landfill sites and three resource recovery facility sites for more detailed evaluation. The critiera used to select these sites included: general location, jurisdiction, size, existing zoning, land use designation and existing land use.

The identified sites were then evaluated by Malcolm Pirnie, Inc. to assess and compare:

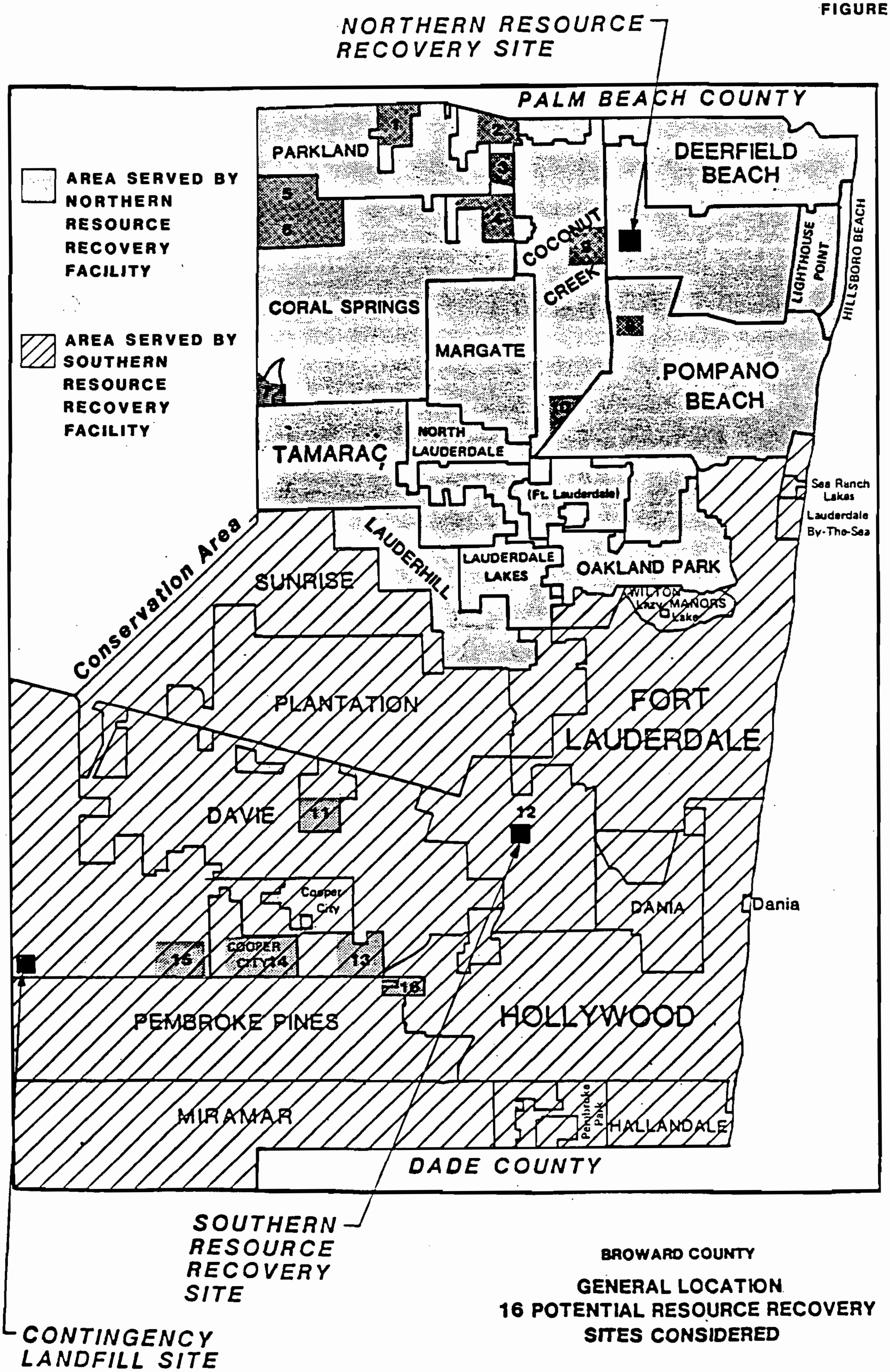
- Site adequacy
- Required transport costs
- Acquisition and development costs
- Access and adequacy
- Potential air and water quality impacts
- Wetland impacts
- Adjacent land use
- Zoning and land use plans
- Traffic impacts
- Conformance with regulations
- Permitting approval probability

As mentioned in Section 8.1, verification of the results of this initial study and supplemental investigations were undertaken by the Broward County Office of Planning, which involved the identification of major undeveloped areas in the County through a review of current aerial photographs. This resulted in the identification of 97 potential sites which were assessed based upon: development status, location with respect to municipal jurisdictions, size, development of regional impact status and presence of large waterbodies. Sixteen potential sites met this criteria and were further evaluated by County staff and Malcolm Pirnie. Figure 3.1.2.1 presents the general location of the sixteen sites considered.

Site Number 8 located between Powerline Road and the Florida Turnpike on Copans Road in unincorporated Broward County was eventually selected by the County. A 140.23 acre site was acquired and rezoned to Planned Unit Development - Special Complexes to allow construction of a resource recovery facility and residue/unprocessable waste landfill to serve North Broward County. In September, 1983, the site was annexed into the City of Pompano Beach. The City immediately began the process of rezoning the site to Light Highway Industrial (I-1). This process was completed in March 1984. The County was unable to reverse this action in court or to rezone the property to another classification which would allow the Project to proceed through normal administrative actions.

In August, 1985, the County Commission directed staff to negotiate with the selected Project vendor, Waste Management, Inc., for use of a site on Hilton Road approximately two miles north of the original site. This unincorporated area location was designated as a potential site in November, 1984, after it was proposed by Waste Management as an alternate to the County owned site.

Waste Management and the County are currently in the process of and seeking rezoning of it to a Planned Unit



BROWARD COUNTY

GENERAL LOCATION
16 POTENTIAL RESOURCE RECOVERY
SITES CONSIDERED

Development - Special Complexes. This process should be completed in April 1986.

3.1.3 Vendor Procurement

On October 12, 1982, the County authorized the procurement process for a full service vendor to provide waste disposal capability including the design, construction, start-up and operation of two mass burn resource recovery facilities, one in northern and one in southern Broward, each with an accompanying residue/unprocessable waste disposal landfill. A prequalification of proposers document, Request for Qualifications (RFQ) was issued on February 1, 1983 requesting information regarding the technical, managerial and financial qualifications of full service vendors interested in participating in the project. Responses from potential vendors were received on March 14, 1983. Ten (10) firms submitted qualification statements for review.

An evaluation of the responses was completed and the results documented in a Engineer's Report entitled "Evaluation of Contractor Qualifications, Full Service Resource Recovery Project." The evaluation concluded and the County Board of Commissioners approved in April 1983 the prequalification of the following three vendors: Browning-Ferris Industries, Inc., Signal RESCO, Inc., and Waste Management, Inc.. These three vendors were thus found eligible to submit detailed proposals in response to a Request for Proposals (RFP) to be drafted by the County. Subsequently, Browning-Ferris Industries, Inc. (BFI) agreed to market waste processing services jointly with Air Products and Chemicals, Inc. under the name American Ref-Fuel Company.

An RFP was issued in September 1983, and proposals were received in January 1984 from Waste Management, Inc. and Signal RESCO; American Ref-Fuel elected not to respond to the RFP. In June 1984, the Broward County Board of Commissioners rejected the proposals as being non-responsive and instructed the County staff and consultants to revise the RFP to reflect current conditions and reissue it to the three prequalified vendors.

The RFP was revised and reissued in September 1984 such that the sizing of the facilities were increased to meet solid waste disposal requirements into the early 1990's, and the County had the flexibility to award separate contracts for the northern and southern facilities. Proposals were received on November 16, 1984 from Signal RESCO and American REF-FUEL for the South Broward County Resource Recovery Project and Signal RESCO and Waste Management for the North Broward County Resource Recovery Project. On July 2, 1985, after an extensive proposal evaluation process, the Board of County Commissioners selected Signal RESCO to be the vendor for the South County Project and Waste Management as the vendor for the North County Project.

Waste Management, Inc.

Waste Management is a recognized leader in the waste services industry because of its demonstrated expertise in planning and operating waste management systems throughout the world.

Waste Management's resource recovery experience includes performance as a full service contractor and operator of a 1,000 ton per day waste-to-electricity plant in Tampa, Florida. Waste Management has owned and operated a 600 ton per day System Volund steam generating plant in the Chicago area for 20 years. In addition, Waste Management is thoroughly familiar with Broward County's solid waste collection and disposal needs through its day-to-day activities in the County and has a major commitment to waste collection and disposal in the South Florida area.

Waste Management will utilize Morrison-Knudsen Company, Inc. to perform overall facility design and the construction utilizing System Vølund technology for waste incineration and energy recovery.

System Vølund

The Vølund Company, which was established in 1875 is headquartered in Copenhagen, Denmark. Vølund is one of the world's most experienced companies in the design and installation of waste-to-energy systems. The world's first continuous flow waste-to-energy plants were designed and installed by the Vølund Company in 1931 and 1932 in Copenhagen, Denmark. These plants operated until 1971 when they were replaced by two large, modern waste-to-energy Vølund plants. Vølund has had a major role in Denmark's achievements in energy recovery from solid wastes, which lead the world, in that more than 65% of its wastes are incinerated in energy recovery plants.

Vølund's Energy Technology and Heat Technology Divisions are widely recognized for their expertise in the design, production, and erection of boilers for residential, utility and industrial use. The Energy Technology Division designed, manufactured, and erected the Ensted Power Station, the largest fossil fuel power station in Scandanavia which produces 4.3 million pounds of steam per hour and is rated at 630 megawatts. Vølund's experience as a major boiler designer and manufacturer will ensure the design of efficient, high temperature and pressure steam conditions for the North Broward County Project. In addition, a number of System Vølund plants in Japan as well as in Tampa are producing electricity. This expertise will be applied to the Project.

3.2 Site Layout

The facility is slated to have an initial maximum installed capacity of 2,200 tons per day and an estimated projected ultimate capacity of approximately 3,300 tons per day. Since the proposed facility will utilize mass-burn technology, there will be no preprocessing of wastes at the facility prior to combustion. Solid waste will be delivered in collection trucks to the facility. It will be dumped directly into a bunker located entirely inside the main facility building. All waste will be stored inside the building, therefore no waste will be visible from the outside. Two of three overhead cranes will mix the solid waste in the bunker and load the charging hoppers as required.

Waste will enter the furnace via a charging hopper and will progress through the combustion chamber by means of a stoker/rotary kiln system that agitates the waste providing the proper air/fuel mixture to complete the combustion process. The resulting ash will be quenched, and the heat from the furnace will be transferred through waterfilled steel tubes lining a waste heat boiler to produce steam. The steam will then be transmitted to turbine generator to produce electricity for internal use and sale to Florida Power and Light Company.

Each furnace train will be equipped with an electrostatic precipitator (ESP) for particulate air emission control. An electrostatic precipitator is a pollution control device that removes small particles from exhaust gases. The gases pass through a strong electric field where the particles are charged and attracted to the opposite electrically charged collecting plates. The dust is then removed mechanically from these plates. The flue gas will be drawn through the ESPs by an induced draft fan located between the stack and the ESPs.

Electrostatic precipitators (ESPs) represent one of the most reliable pieces of equipment in a facility of this type. Modern ESPs installed at the facility will be equipped with continuous readout devices for performance monitoring. Further, the application of mircoprocessors on these ESPs for optimal operating control has resulted in a high degree of performance reliability. These factors in combination with periodic, routine inspection and maintenance effectively minimize the frequency of malfunction.

It is important to note that, except in the case of a complete ESP system failure which rarely, if ever occurs, malfunction of an ESP does not mean pollutants escape from the facility with no removal or control being afforded. Rather, the microcircuitry designed into the control system will register a decay in applied voltage, as an example, before the condition manifests itself in terms of a significant reduction in pollutant removal efficiency. When such a condition occurs, the ESP can be brought off-line, together with the balance of the effected furnace train, before the degree of pollutant control is seriously compromised. Immediately upon noting such a condition, waste charging to the furnace train would cease, refuse present on the furnace grate would proceed under normal combustion design conditions to a burnout state, the furnace would be allowed to return to a cold condition and the ESP disengaged from service. Inspection and maintenance would then be performed to correct the malfunction.

The carryover of burning cinders into the ESP is not considered a major problem in the proposed furnace/boiler design. Fluidization of waste which might cause such carry-over is minimized by introduction of primary air at low velocity.

Those cinders which are entrained tend to be very small and burn out due to the long retention time in the furnace and waste heat boiler or settle out in the boiler hoppers and heat transfer surfaces.

Bottom ash from the furnace and flyash from the precipitator will be mixed prior to removal from the facility. The combined ash will comprise approximately 10 percent of the volume and 25 percent of the weight of the solid waste processed by the facility. The ash will be quenched with water to about 30 percent moisture prior to transport to the adjacent Central Disposal landfill.

While the proposed facility will have ultimate design capacity of approximately 3,300 tpd and six boiler units, its maximum initial installed capacity will be 2,200 tpd and four boiler units. Each boiler unit operates independently from the others. It will, therefore, be possible to routinely shut down units for periods of maintenance and inspection and still continuously operate the facility.

3.2.1 Site Selection

The Broward County Board of County Commissioners selected the Hilton Road site for the North Broward County Resource Recovery Project site on August 13, 1985 after a lengthy and comprehensive site selection process that began in 1981. A detailed account of the site selection process is presented in Section 8.1, "Alternative Sites".

3.2.2 Resource Recovery Facility

As illustrated on Figure 2.1.3.1 and described in Section 2, Site and Vicinity Characterization, the resource recovery facility will be developed such that:

- o The main on-site roadway will provide two-way traffic (north and south).
- o A visitor parking area and administrative building will be located east of the main facility building.
- o Vehicles entering the site will be weighed at the scalehouse/weigh station located between the main facility building and site entrance.
- o A receiving area including an enclosed turning platform, tipping floor, overhead crane, and refuse pit will be located on the north side of the main facility building.
- o The furnace/boilers and auxiliary equipment will be located south of the receiving area.

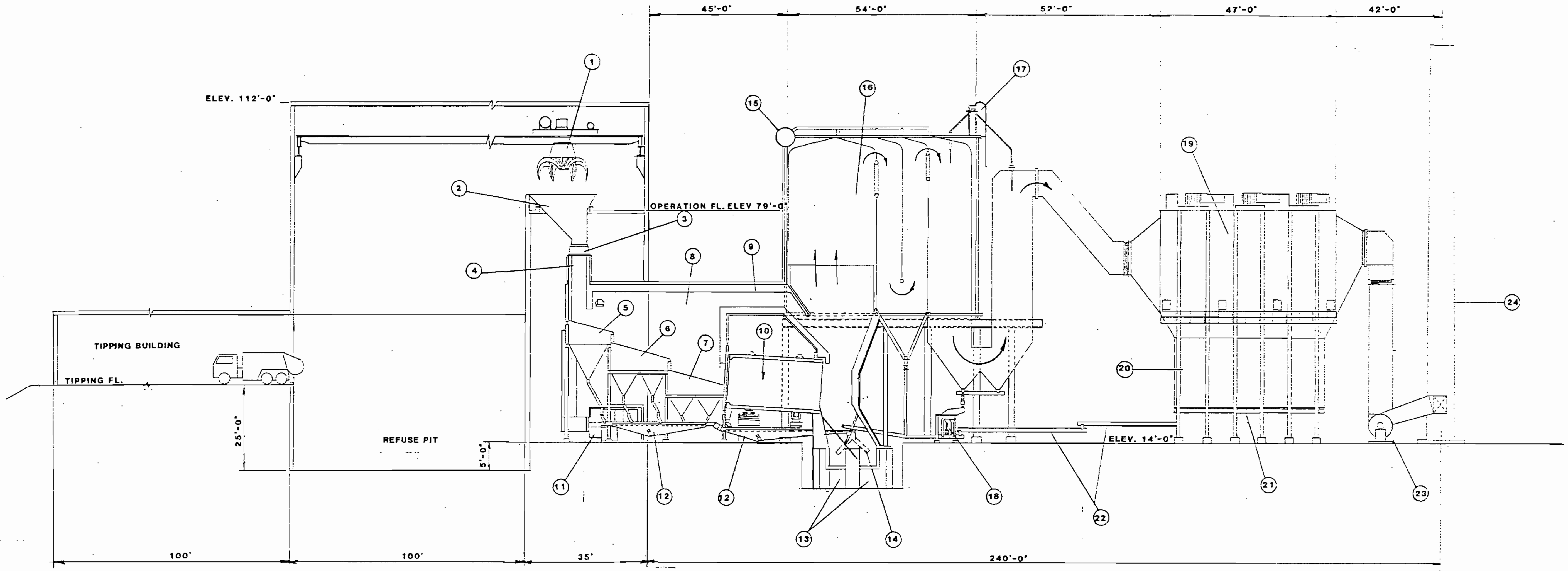
- o The turbine generator will be located adjacent to the furnace/boilers.
- o The electrostatic precipitators (air pollution control equipment) will be located south of the boilers, adjacent to the ash handling area and directly in front of the plant's stack.
- o The electrical substation necessary to tie into the Florida Power and Light grid system will be located just east of the facility stack.

The following figures and descriptions have been included to provide an overview of the resource recovery facility's operations. The figures were supplied by Waste Management, Inc. and Figure 3.2.1.1 presents a cross sectional view of the facility.

Plant Design

The Plant is designed to be architecturally pleasing and take into account existing site conditions. With the low site elevation large volumes or fill are required to raise the finished grade above the 100-year flood plain. The low site elevations also make it impractical and inordinately costly to build substantial structures, such as the waste storage pit, below grade level. Therefore, the design elevation of the slab for the plant floor and pit base is only a few feet below finished grade in contrast to a more conventional pit design where the base is often extended well below grade. The tipping floor is approximately 20 feet above finished grade and vehicle access is by fill-supported elevated ramps. The pits are approximately 28 feet deep, 255 feet long and 100 feet wide. This wide, shallow pit design avoids the complications and expense of elevating the tipping floor and access ramps to the high elevation that would be required by the typical deep, narrow pit. This design provides for the discharge of 18 vehicles simultaneously.

FIGURE 3.2.1.1



1 REFUSE CRANE
2 CHARGING HOPPER
3 CHARGING DAMPER
4 CHARGING CHUTE
5 DRYING GRATE
6 BURNING GRATE #1
7 BURNING GRATE #2
8 FURNACE
9 BY-PASS DUCT
10 ROTARY KILN
11 SECONDARY AIR SYSTEM
12 SIFTING CONVEYORS
13 BOTTOM ASH VIBRATING CONVEYOR
14 DOUBLE FLAP GATE
15 DRUM
16 BOILER (5-PASS)
17 SHOT CLEANING SYSTEM
18 ROTARY VALVE
19 ELECTROSTATIC PRECIPITATOR
20 FLY ASH COLLECTION HOPPER
21 PRECIPITATOR ASH COLLECTING SCREW CONVEYOR
22 FLY ASH SCREW CONVEYORS
23 INDUCED DRAFT FANS
24 STACK

REV.	DATE	DESCRIPTION	DR BY	APP BY

SCALE:

PROJECT NO.

PROJECT TITLE: NORTH BROWARD COUNTY RESOURCE RECOVERY PROJECT

DES BY

DR BY J. URQUHART 11/5/85

CHK BY

APP BY

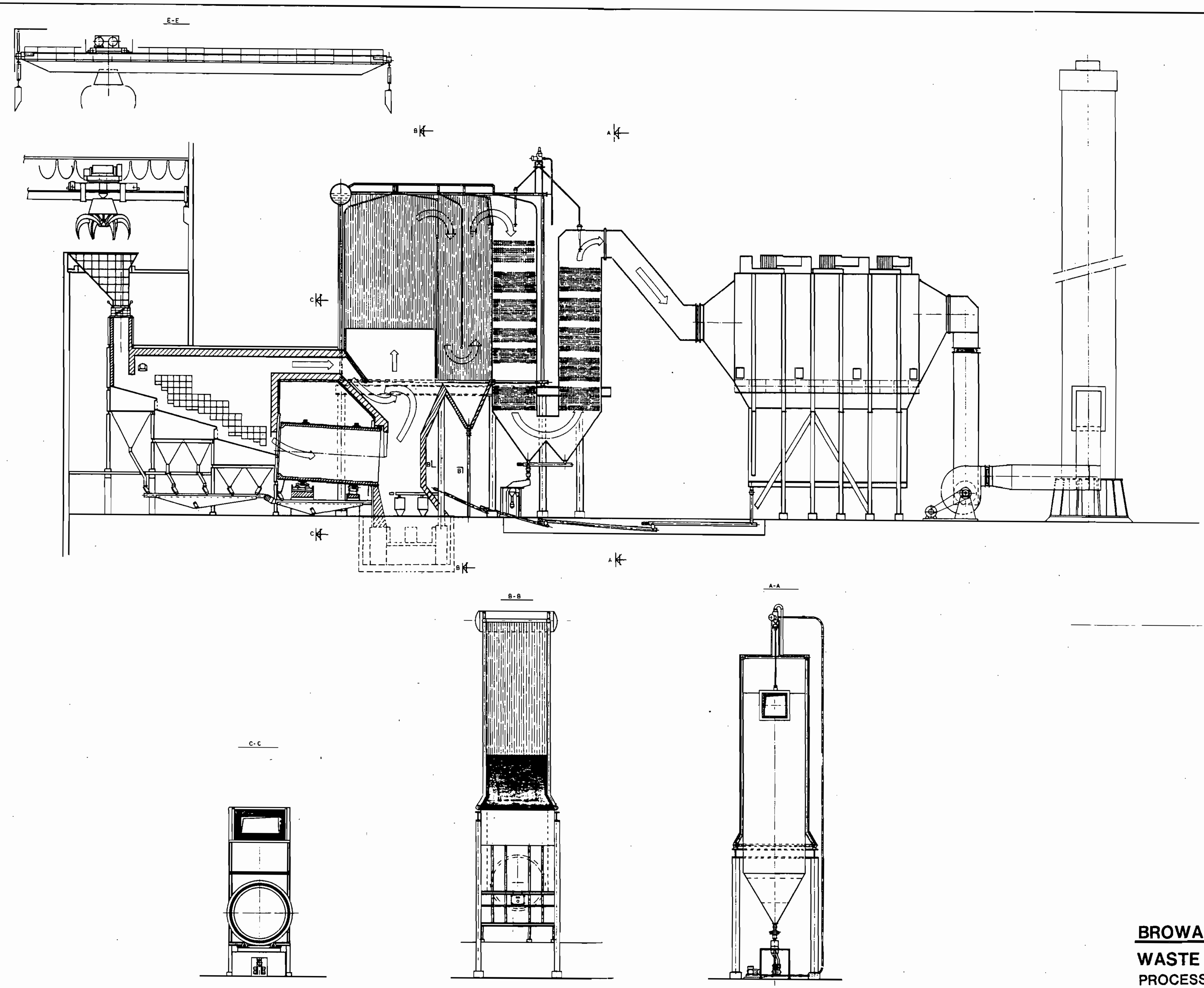
SHEET TITLE: GENERAL ARRANGEMENT SECTION

SHEET ____ OF ____

DRAWING NO. D-G-105

Waste Management, Inc.-Resource Recovery
10008 N. Dale Mabry Hwy
Tampa, Florida 33618

FIGURE 3.2.1.2



BROWARD COUNTY, FLORIDA

WASTE TO ENERGY PROJECT

PROCESS LINE - SECTION

DWG. NO. 14

Processible waste delivered to the Plant will be dumped directly into the waste storage pit. The waste storage pit is sized to hold a four-day volume of waste generation. The pit also provides surge capacity and waste storage for operations during periods when waste is not delivered to the Plant. Waterline volume of the pit is 26,444 cu. yds. Materials in the pit which are not appropriate for processing, such as white goods and potentially hazardous materials, are removed from the pit using the overhead crane. These materials are placed via a bypass bay located at one end of the hopper floor into trucks for transport to the landfill.

Processible waste is removed from the pit and fed to the charging hopper of each individual process line (Figure 3.2.1.2). The cranes are operated from the control room from which the entire pit can be viewed. The entire tipping area is enclosed and combustion air necessary for furnace operation is drawn from this part of the building. This design configuration maintains a slight negative pressure which effectively prevents odor and dust from escaping the tipping building. An additional odor scrubbing system is not deemed necessary due to the multiple number of operating lines where at least one will always be operating.

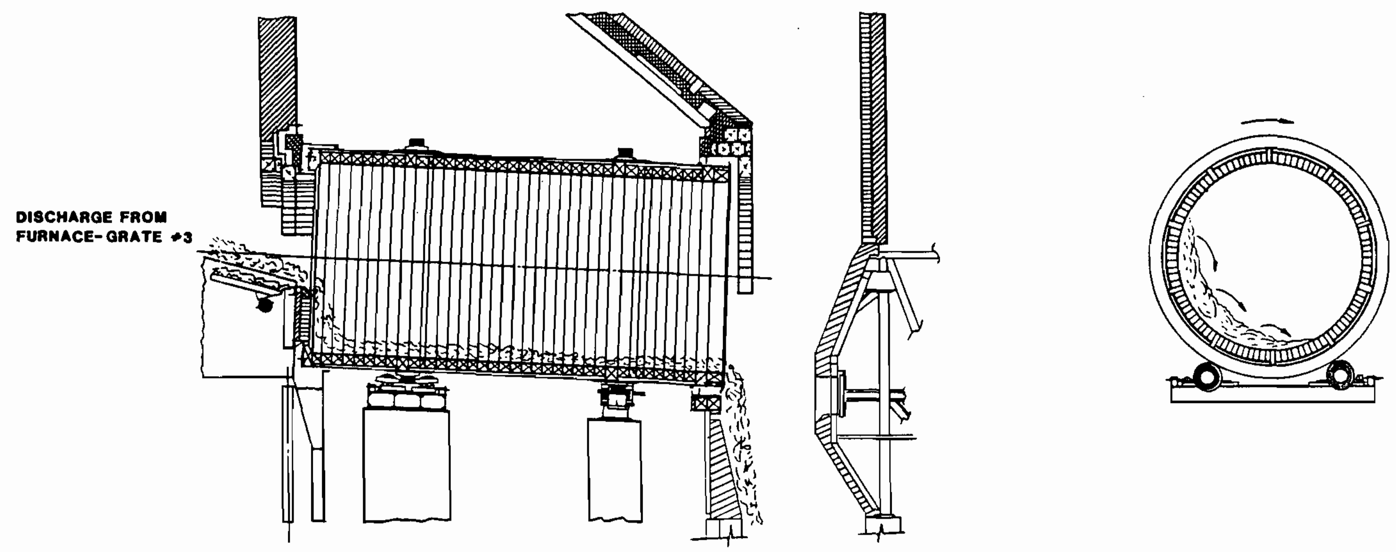
Combustion System

Each of the furnaces is equipped with a charging hopper into which the crane deposits waste. The hoppers are designed for even flow of waste into the charging chute and are equipped with a closed circuit television system to permit close monitoring of waste feeding operations. The chute is equipped with a damper which can be used to seal the furnace. Normally the refuse in the chute provides an air seal to the furnace which is under negative pressure, thus enabling close control of furnace air flows.

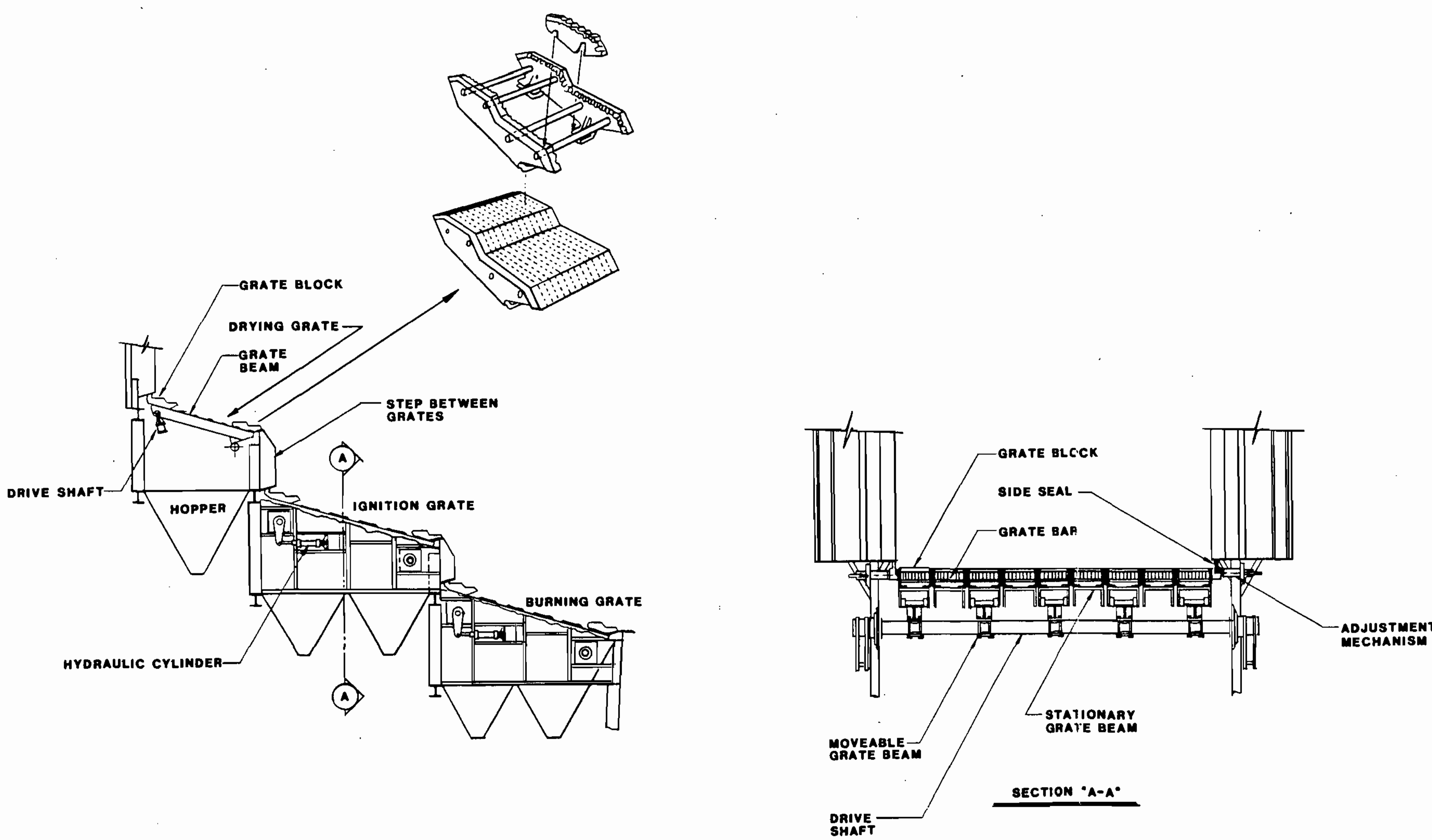
From the lower section of the charging chute the waste flows evenly onto the grates. The VØlund furnace utilizes a reciprocating step-grate design comprised of three separate grate sections (Figure 3.2.1.3). The refuse is dried and partially ignited on the first grate section and as it moves forward into the furnace, the rocking motion of the grate sections cause it to tumble, thus ensuring thorough mixing and drying. From the drying grate the refuse drops down onto the first burning grate where complete ignition of the refuse takes place. The refuse then falls onto the second burning grate on which the more volatile material is burned out. At the grate transitions, additional tumbling of the refuse takes place, ensuring that refuse is brought to the surface, ignited and burned. The action of the VØlund grate system also provides for an effective lifting and shearing movement, particularly of the lowest refuse layers, and ensure effective distribution of the combustion air. System VØlund employs proprietary self-cleaning grate bars which are efficiently cooled and easily interchangeable.

The heat for drying and ignition of the waste is supplied partly by the flue gases generated by the combustion of the refuse and partly by heat radiation from the hot refractory walls and brick arches of the furnace structure. No auxiliary fuel is used at any time during operation. The temperature of the flue gases exiting the furnace are maintained at approximately 1,750°F (954°C) ±50°F. The furnace is refractory lined on all sides with air cooling of the refractory walls immediately above the grate line to reduce slag accumulation on the walls. The refractory lining ensures an even distribution of radiant heat over the grate and acts as a "thermal flywheel" in maintaining a stable level of combustion on the grate.

From the last burning grate the refuse passes into the refractory-lined rotary kiln (Figure 3.2.1.3). Complete com-



ROTARY KILN



GRATE SYSTEM

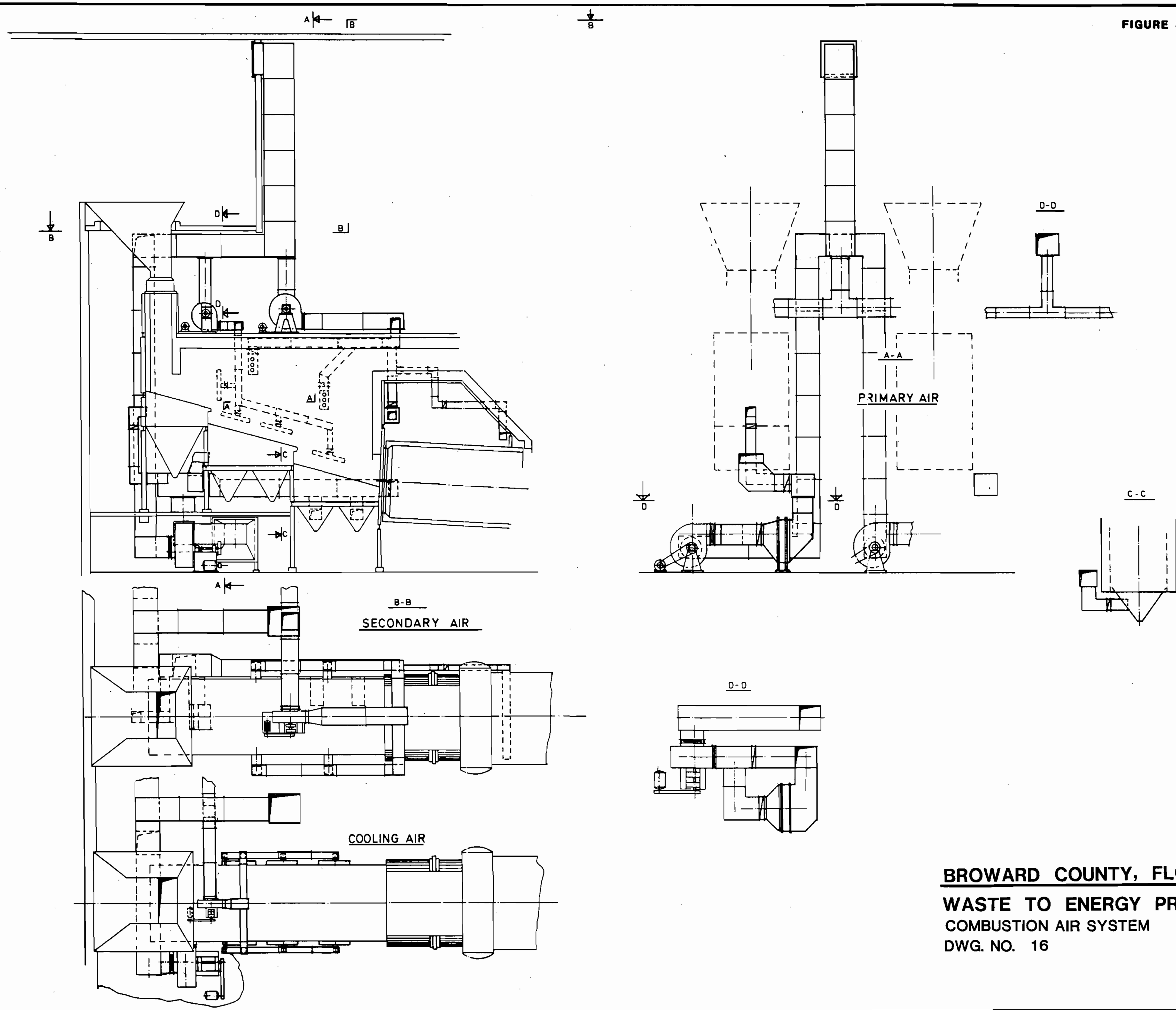
BROWARD COUNTY, FLORIDA

WASTE TO ENERGY PROJECT

KILN & GRATE DETAILS

DWG. NO. 15

FIGURE 3.2.1.4



BROWARD COUNTY, FLORIDA

WASTE TO ENERGY PROJECT

COMBUSTION AIR SYSTEM

DWG. NO. 16

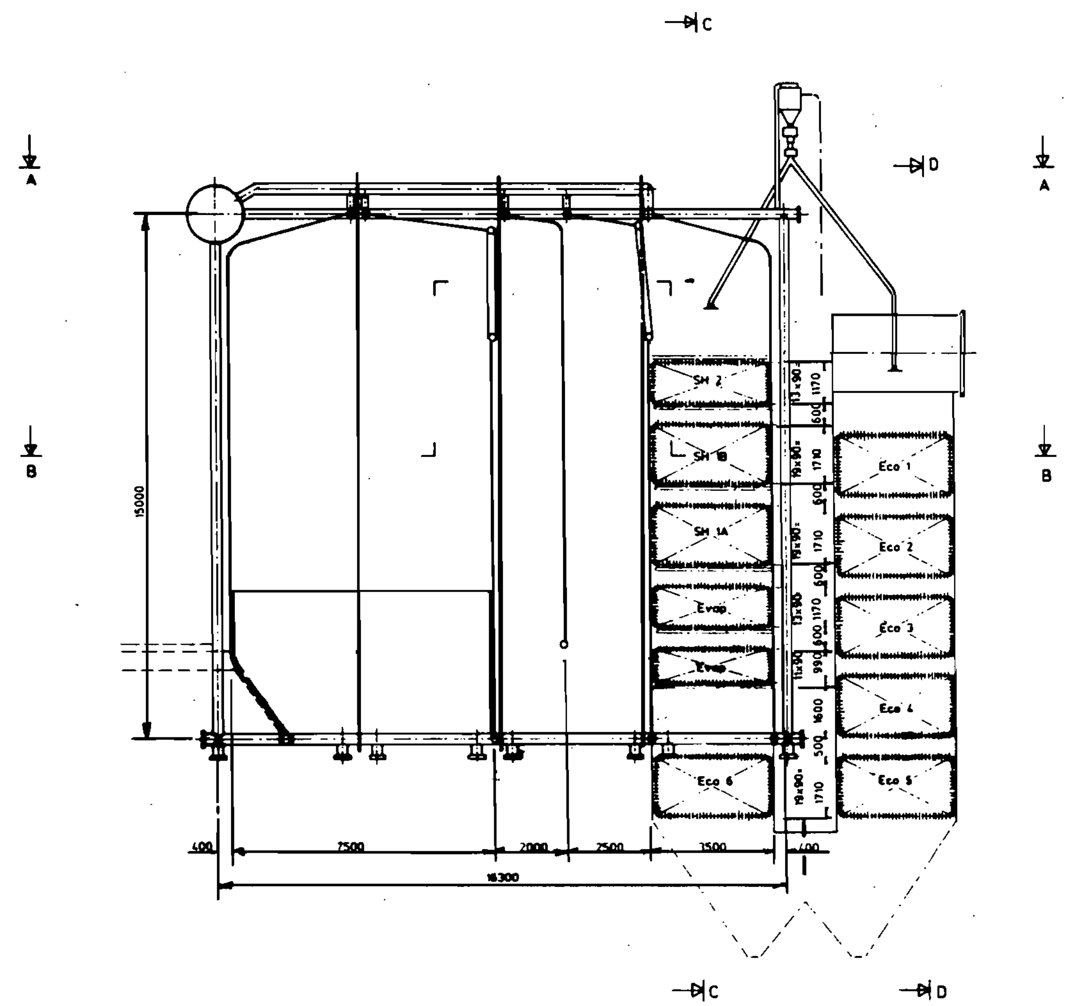
Steam Generation System

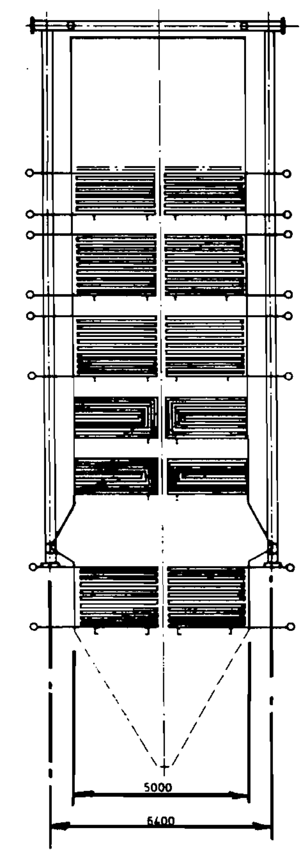
From the afterburner chamber the hot flue gases flow through a waterwall waste heat boiler which is designed exclusively for refuse combustion service (Figure 3.2.1.5). The boiler has five vertical passes. The first three passes from the radiation section and the last two passes contain the superheater, evaporator and economizer sections. The waterwalls in the radiation section are gas-tight welded membrane walls and the alloy superheater tube banks are of two-stage in-line design. Superheated steam is generated at 950 psig/842°F (66 bar/450°C).

Low gas velocity is maintained in the boiler which results in less erosion from fly ash. The gas flow patterns within the boiler are such that a large part of the coarse fly ash is disentrained and collected in ash hoppers below the boiler. The soot cleaning system is of the shot type and includes a blower, and piping and ash separation unit.

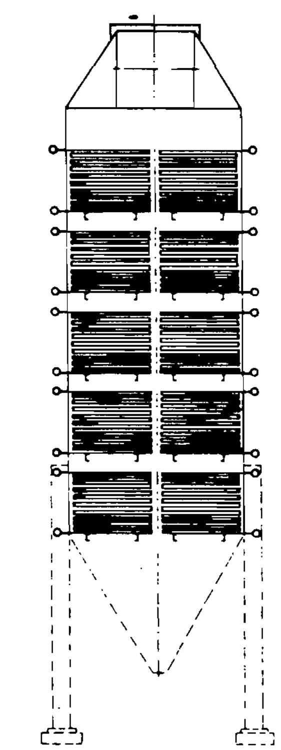
A feedwater system consisting of turbine and motor-driven pumps, heaters, and necessary controls, supply treated feedwater to the boiler at 280°F (138°C). In order to provide water quality sufficient to insure optimum performance of the boiler and to minimize corrosion, a make-up water treatment system is included in the design. The process water from the available county water system is demineralized and inhibited by the addition of chemicals. The high temperature boiler/turbine system requires high-purity water to protect the boiler tubes and turbine surfaces from corrosion and scaling. A single bed cation/anion ion-exchanged system is provided for this purpose. The water treatment system provided in the design will produce the high quality boiler makeup water required and will thus reduce boiler blowdown requirements.

FIGURE 3.2.1.5

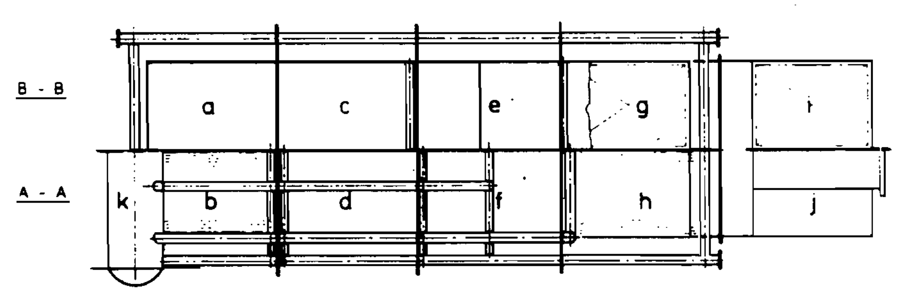




C - C



D - D



This drawing is for quotation only and the final design has to be corrected according to the shop drawings, the ASME Code and the strength calculations.

Flue Gas: 114.314 Nm³/h (100°) - 954°C/180°C
Steam Data: 66 bar - 450°C
Feedwater: 138°C

BROWARD COUNTY, FLORIDA

WASTE TO ENERGY PROJECT

BOILER ARRANGEMENT

DWG. NO. 18

Ash Handling System

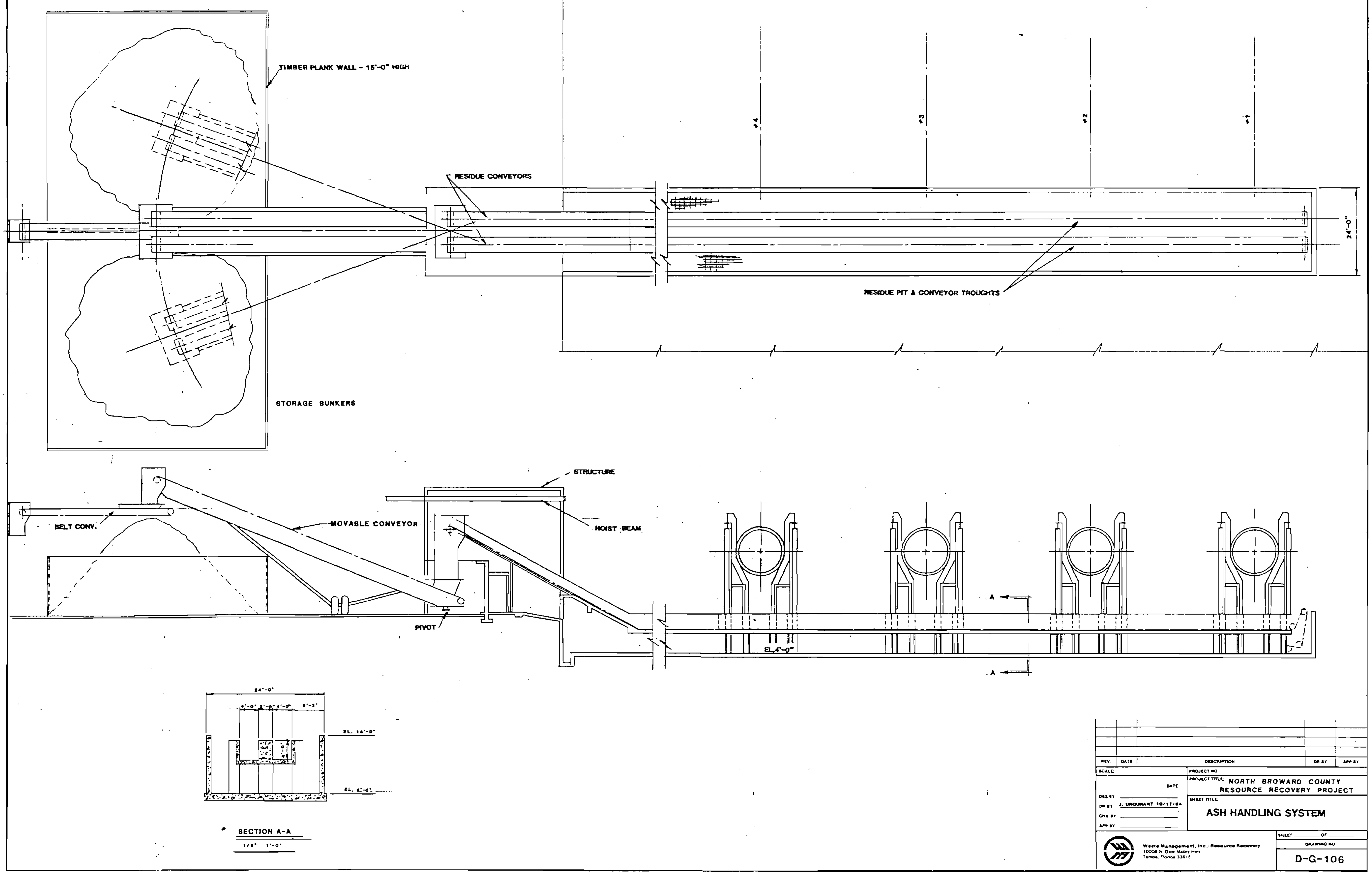
Ash from the combustion process falls from the rotary kiln into a quench trough from which is is removed by an drag chain conveyor (Figure 3.2.1.6). For reliability, the quench trough and conveyor system is fully duplicated. The makeup water required for the quench trough is supplied from boiler and cooling tower blowdown. The drag chain conveyor carries the ash up to an elevated transfer tower. The cooled ash then falls onto one of two redundant belt conveyors for transport to the ash loadout area behind the Plant.

Fine particles which fall through the grates will be collected in hoppers below the grates and transported by enclosed vibrating conveyors to the quench trough, where it is mixed with ash from the rotary kiln. The fly ash collected in the boiler sections is conveyed by means of rotary valve and screw conveyors to this area also. The fly ash separated in the electrostatic precipitator is also transported via screw conveyors to the bottom ash collection area. The fly ash collected in the boilers and ESP's is combined with the bottom ash before leaving the Plant area. The combined ash stream is anticipated to be accepted for unrestricted landfilling. Generally, combustible material remaining in the ash is typically less than 2% of the total ash content, depending on the test method used. Putrescibles remaining in ash are generally less than 0.2%. The ash is approximately 5 to 10% by volume and 30% by weight of the raw waste.

Environmental Control System

Each furnace line is equipped with a three-field electrostatic precipitator (ESP) to remove the remainder of the fly ash from the flue gases. The ESP is designed to limit particulate matter emissions to 0.02 grains/dscf corrected to 12% CO_2, maximum. Based upon good engineering practices and experience at other waste incineration facilities, the other regulated pollutants are expected to be within an acceptable

FIGURE 3.2.1.6


TIMBER PLANK WALL - 15'-0" HIGH
RESIDUE CONVEYORS
#4
#3
#2
#1
24'-0"
RESIDUE PIT & CONVEYOR TROUGHTS
STORAGE BUNKERS
STRUCTURE
HOIST BEAM
MOVABLE CONVEYOR
BELT CONV.
PIVOT
EL 4'-0"
A
A
24'-0"
EL. 14'-0"
EL. 4'-0"
SECTION A-A
1/8" 1'-0"
REV.
DATE
DESCRIPTION
DR BY
APP BY
SCALE:
PROJECT NO
PROJECT TITLE: NORTH BROWARD COUNTY
RESOURCE RECOVERY PROJECT
DATE
DES BY
DR BY J. URQUHART 10/17/84
CHK BY
APP BY
SHEET TITLE:
ASH HANDLING SYSTEM
SHEET ___ OF ___
DRAWING NO
Waste Management, Inc.- Resource Recovery
10006 N. Dale Mabry Hwy
Tampa, Florida 33618
D-G-106

range of emissions. The flue gases flow through a duct from the boiler to the precipitator, which is essentially a gas-tight steel casing in which vertical electrodes are suspended. The electrodes are charged with high voltage electricity and the resulting field causes the dust particles within the flue gas to become charged. The particles are then attracted to the electrode plates and are periodically shaken loose by mechanical rappers. The precipitators are equipped with automatic voltage controls and environmental monitoring equipment to insure continuous optimum operation. The units are designed for outdoor installation and incorporate electric hopper heating and full insulation to avoid condensation.

Power Generation System

Steam generated in the boilers is piped to a fully-condensing turbine-generator, nominally sized at approximately 55.5 MW, where electricity is generated. A portion of the power generated is directed by appropriate switchgear to meet in-plant requirements. The remaining electric power is stepped-up to transmission line voltage for sale to Florida Power and Light Company.

The turbine-generator is provided with all appurtenances required for proper operations, including cooling system, exciter and voltage regulation system, and electrohydraulic control systems. Three extraction points are provided deaeration and feedwater heating. A dump condenser is provided to receive and dissipate heat from the full flow of steam in the event that the turbine-generator is out of service. The extensive power distribution system includes all switchgear, transformers, controls and accessories required for effective power distribution.

A circulating water system provides cooling water to the condenser. After service in the condenser, circulating water is cooled in a three-cell mechanical draft cooling tower.

Control System

Plant operations are monitored and controlled from the central control room. The plant operators and crane operators, with their controls, are located in the control room to facilitate corodinated plant operation. Each furnace line has a main control board fully instrumented and equipped with processed controls to monitor waste combustion, steam production, and other process variables. An automatic combustion control system monitors furnace temperature at several locations within the furnaces and modulates combustion air feed. Control of the electrical generation facility is also accomplished from the central control room. The design has extensive microprocessing capability to compile data, alarm deviations, and display control function readouts, permitting computer assisted Plant operation.

Support Facilities

The proposed Project design utilizes centralized administration and control facilities thereby affording coordinated and cost effect project management. The administrative facilities located within the main building will house plant management, plant supervisory personnel, County personnel, a visitors' center, and a conference room. Offices within the plant accommodate plant operating and maintenance personnel.

The majority of the office space and administrative functions are housed in the floors below the main control room at the east end of the refuse pit. On the first floor, a machine shop and associated storage area will be located, in order to provide support to the furnace and turbine-generator area. On the second floor (El. 36-0"), will be the locker/change room facilities, and the general offices. The third floor (El. 51'-0"), will include library, conference, and accounting facilities. Management, reception, and visitor functions are located on the fourth level (El. 65'-0"). All support facilities are illustrated on Figure 3.2.1.7.

Typical east, west, south and north elevation views of the facility are provided in Figures 3.2.1.8, 3.2.1.9 and 3.2.1.10, respectively. As these views illustrate, the facility will be designed to provide a pleasing aesthetic appearance.

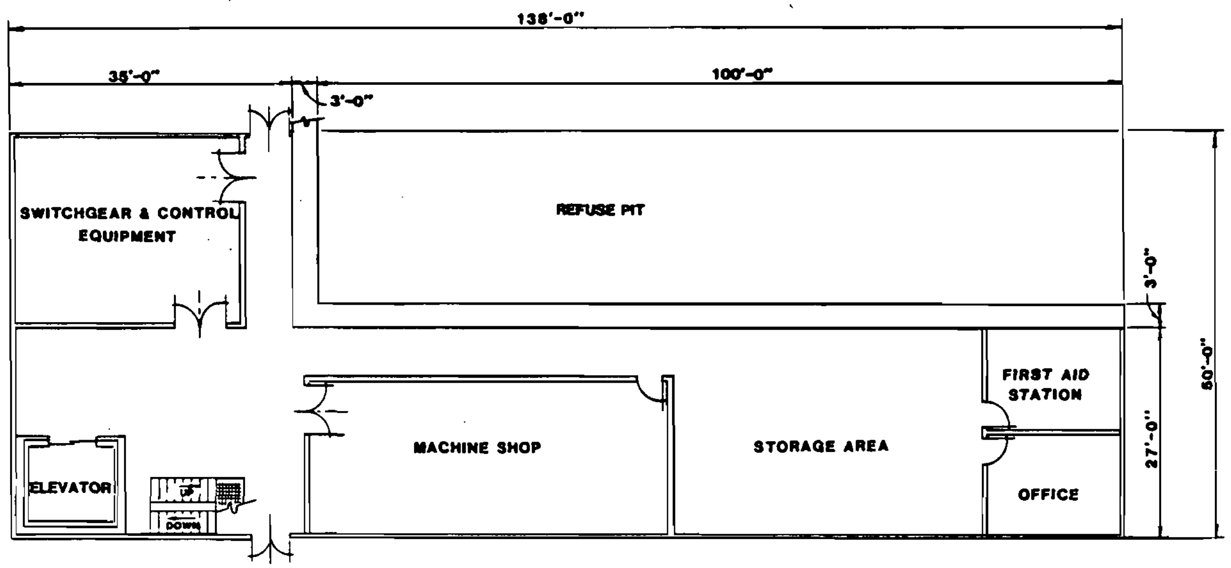
3.2.3 Contingency Disposal

Contingency plans have been formulated to address periods during which raw refuse processing capability is unavailable due to either scheduled or unscheduled downtime at the proposed facility. Basically, the overall contingency plan consists of a multi-phased approach. We wish to note that the processing capacity of the proposed facility has been selected based, in part, on a projected annual availability factor of at least 80 percent. This factor includes scheduled downtime for routine maintenance activities as well as unscheduled downtime for unforeseen circumstances based on operating experience at other similar facilities.

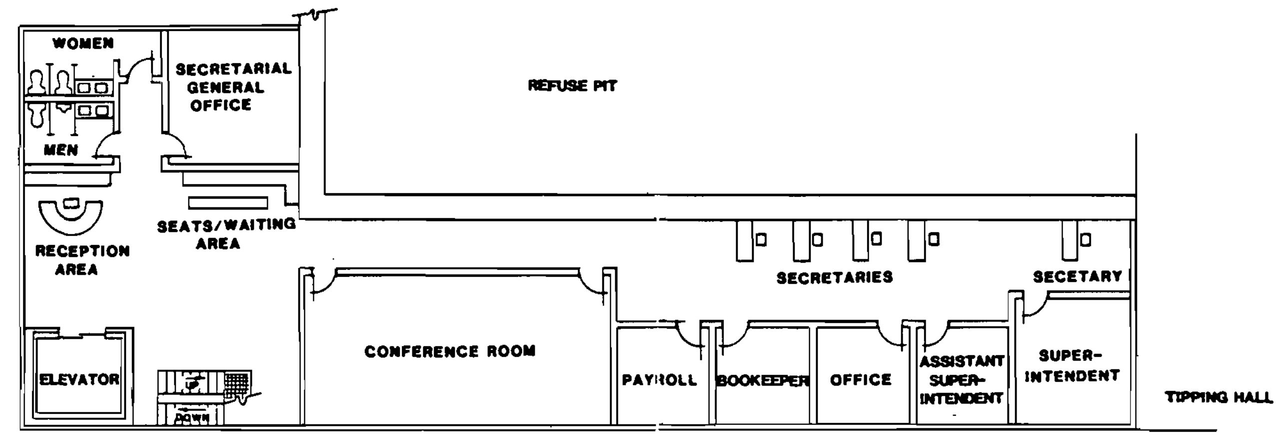
The first phase of the contingency plan is the storage capacity of the receiving pit and multiple, redundant processing units at the proposed facility. A minimum four-day pit capacity represents one of the facility design criteria. While the primary purpose of this requirement is to assure adequate on-site storage of refuse to sustain plant operations over a weekend, the excess pit capacity that will normally be available could be used to store incoming refuse for one to three days when the facility is down for scheduled or unscheduled maintenance. Thus, during such periods refuse delivery to the facility will proceed uninterrupted.

The following three cases have been prepared to illustrate the waste processing capabilities of the plant with one or more units out of operation.

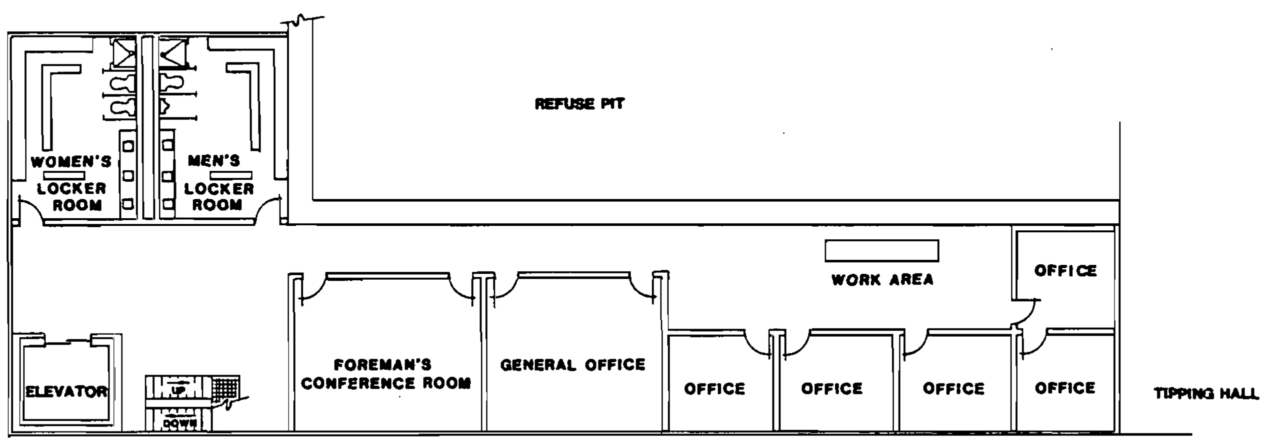
FIGURE 3.2.1.7



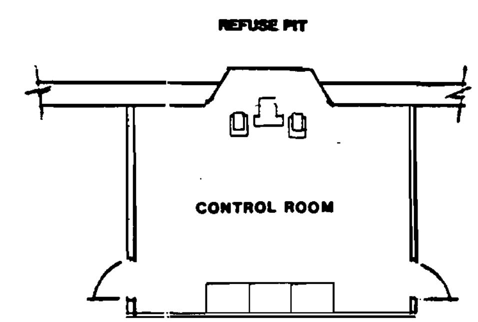
1st FLOOR
ELEVATION 14'-0"



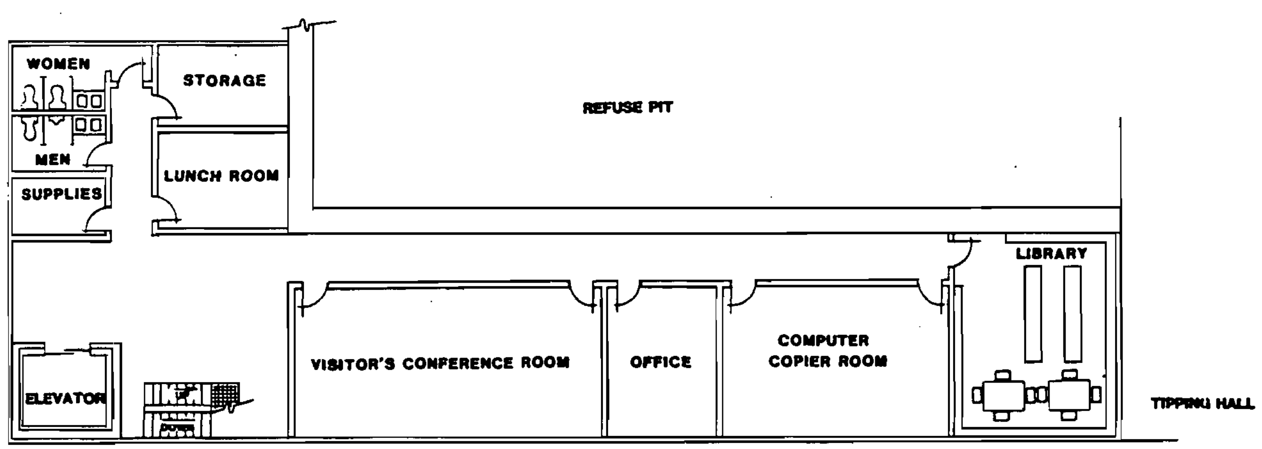
4th FLOOR
ELEVATION 65'-0"



2nd FLOOR
ELEVATION 36'-0"



5th FLOOR
ELEVATION 79'-0"



3rd FLOOR
ELEVATION 51'-0"

GRAPHIC SCALE

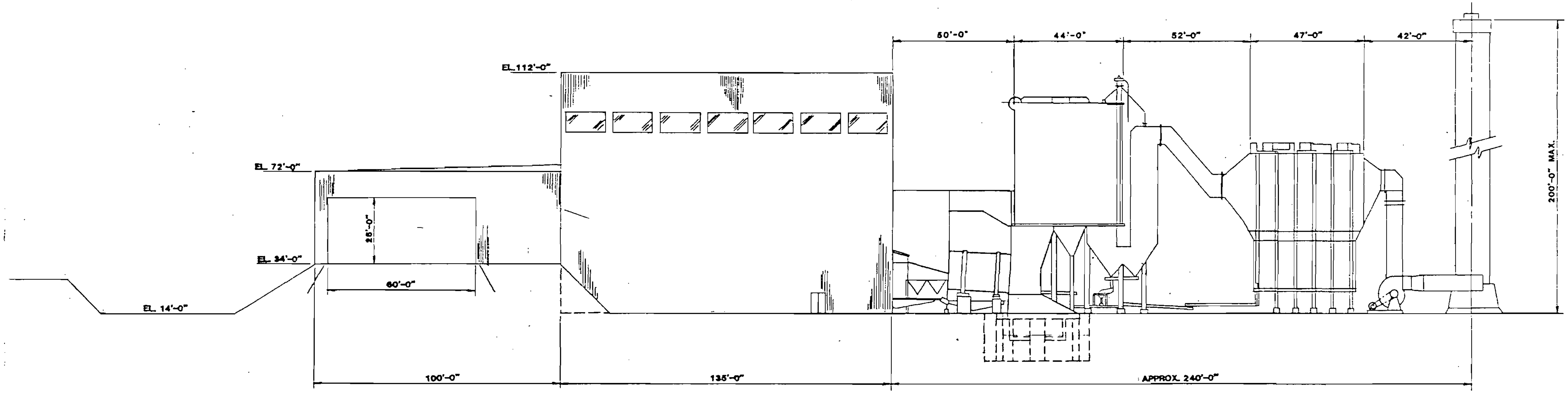
BROWARD COUNTY, FLORIDA

WASTE TO ENERGY PROJECT

SUPPORT FACILITIES

DWG. NO. 11

FIGURE 3.2.1.8



WEST ELEVATION

REV.	DATE	DESCRIPTION	DR BY	APP BY

SCALE: 1" 20'

PROJECT NO.

PROJECT TITLE: NORTH BROWARD COUNTY RESOURCE RECOVERY PROJECT

DES BY

DR BY J. URQUHART 10/1/86

CHK BY

APP BY

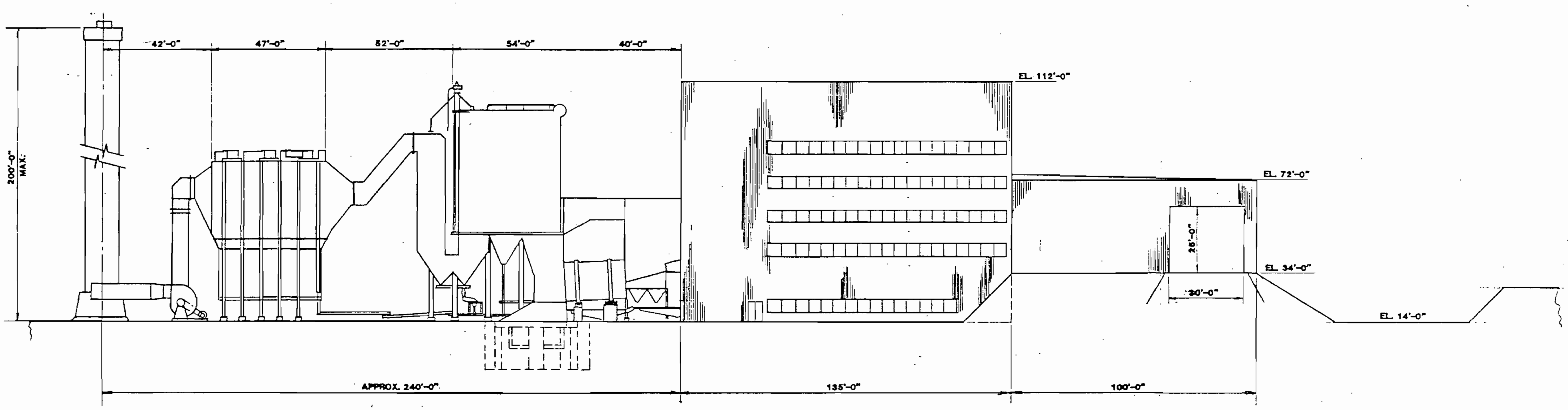
SHEET TITLE: BUILDING ELEVATIONS

SHEET ____ OF ____

Waste Management, Inc. - Resource Recovery
10008 N. Dale Mabry Hwy
Tampa, Florida 33618

DRAWING NO. D-G-102

FIGURE 3.2.1.9



EAST ELEVATION

REV.	DATE	DESCRIPTION	DR BY	APP BY

SCALE: 1" = 20'-0"

PROJECT NO

PROJECT TITLE: NORTH BROWARD COUNTY RESOURCE RECOVERY PROJECT

DATE

DES BY

DR BY J. URQUHART 10/1/86

CHK BY

APP BY

SHEET TITLE: BUILDING ELEVATIONS

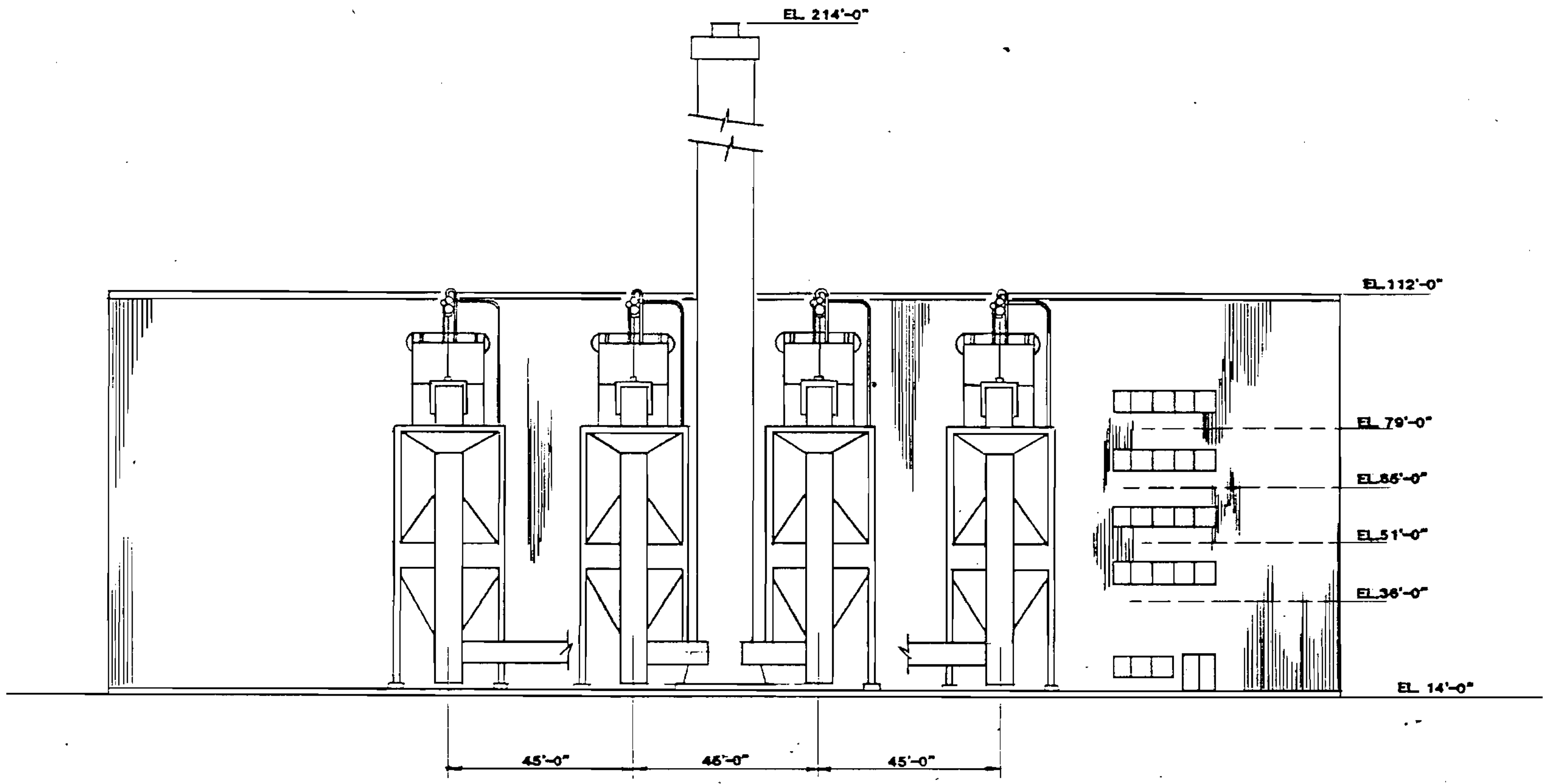
Waste Management, Inc. - Resource Recovery
10006 N. Dale Mabry Hwy
Tampa, Florida 33618

SHEET ____ OF ____

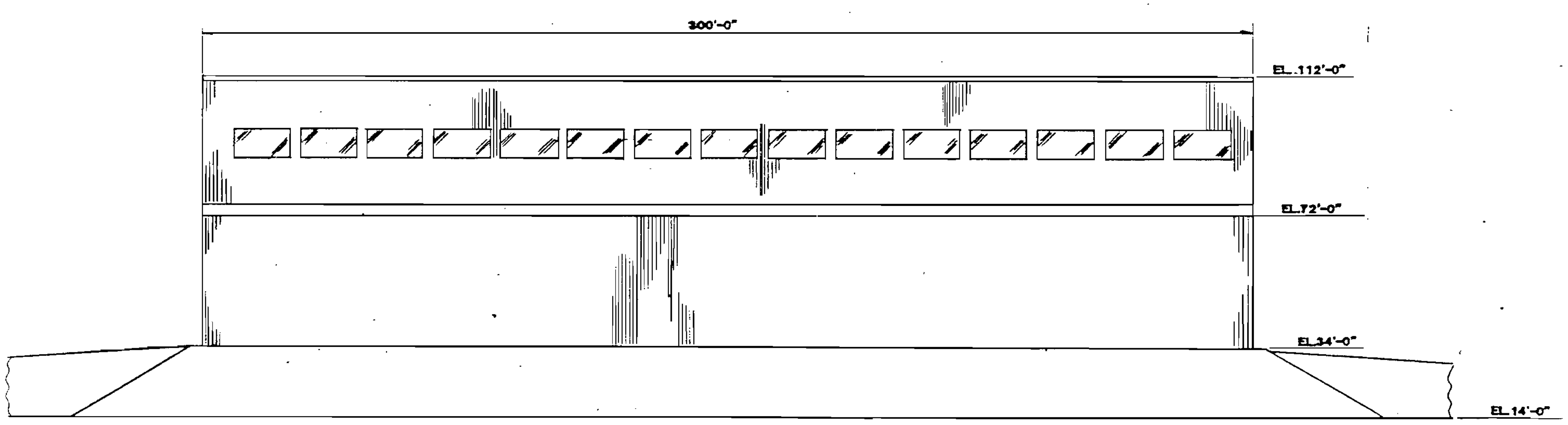
DRAWING NO

D-G-103

FIGURE 3.2.1.10



SOUTH ELEVATION



NORTH ELEVATION

REV.	DATE	DESCRIPTION	DR BY	APP BY

SCALE: 1" = 30'-0"

PROJECT NO

PROJECT TITLE: NORTH BROWARD COUNTY RESOURCE RECOVERY PROJECT

DATE

DES BY

DR BY J. URQUHART 10/1/84

CHK BY

APP BY

SHEET TITLE: BUILDING ELEVATIONS

Waste Management, Inc. - Resource Recovery
10008 N. Dale Mabry Hwy
Tampa, Florida 33618

SHEET ______ OF ______

DRAWING NO

D-G-104

Assumptions:

- o The plant will operate 24 hours per day, 7 days per week.
- o The plant will receive approximately 11,900 tons of waste per week (2,380 tons per day, Monday through Friday).
- o The plant will have four (4) units, each unit having a nameplate capacity of 550 tons per day.
- o The storage pit will have a water level storage capacity of approximately 26,444 cubic yards. (Based on a stored density of 500 pounds per cubic yard, the pit will store 8,000 tons of waste.)

Case I - Two Unit Operation

One unit shuts down due to mechanical failure at 6:00 a.m. on Monday. The remaining three units are capable of operating at 100% of their nameplate capacity. The pit at the time of breakdown contains 850 tons (normal minimum half day storage reserve).

Time/Day	Received	Processed	Waste in Pit
			850T
6 a.m. Mon #1	2380T	1650T	+730
6 a.m. Tues.			1580
	2380T	1650T	+730
6 a.m. Wed.			2310
	2380T	1650T	+730
6 a.m. Thurs.			3040
	2380T	1650T	+730
6 a.m. Fri.			3770
	2380T	1650T	+730
6 a.m. Sat.			4500
	0	1650T	-1650
6 a.m. Sun.			2850
	0	1650T	-1650
6 a.m. Mon #2			1200

Case II - Continuation of Case I

At 6 a.m. on the second Monday of Case I, second unit shuts down due to mechanical failure. The remaining unit continues to process waste at 100% of its nameplace capacity.

Time/Day	Received	Processed	Waste in Pit
6 a.m. Mon #2			1200T
	2380T	1100T	+1280
6 a.m. Tues.			2480
	2380T	1100T	+1280
			3760
6 a.m. Wed.	2380T	1100T	+1280
6 a.m. Thurs.			5040
	2380T	1100T	+1280
6 a.m. Fri.			6320
	2380T	1100T	+1280
6 a.m. Sat.			7600
	0	1100T	-1100
6 a.m. Sun.			6500
	0	1100T	-1100
6 a.m. Mon. #3			5400
		1100T	+1280
6 a.m. Tues.			6680

Note: The pit will be filled to capacity sometime during the morning of Monday #3. (This example also indicates the processing capability of the plant if on any Monday morning two of the four units suddenly go off line.)

Case III - Alternate to Case II

At 6 a.m. on Saturday of Case I, a second unit shuts down due to mechanical failure. The remaining units continue to process waste at 100% of their nameplate capacity.

Time/Day	Received	Processed	Waste in Pit
6 a.m. Sat. #1			4500T
		1100T	-1100
6 a.m. Sun			3400
		1100T	-1100
			2300
6 a.m. Mon. #2	2380T	1100T	+1280
6 a.m. Tues.			3586
	2380T	1100T	+1280
6 a.m. Wed.			4860
	2380T	1100T	+1280
6 a.m. Thurs.	0	1100T	+6140

Note: The pit will be filled to capacity sometime during Wednesday #2.

The above three scenarios show that the plant will continue to receive the entire waste stream without any by-pass to the landfill or other facility; for numerous days (Case I); for seven days when two units fail simultaneously (Case II); or for ten days when two units fail in a staggered manner (Case III). At no time during such periods would incoming refuse be delivered or stored outside the enclosed pit area or diverted to the adjacent landfill.

As discussed above, the facility will consist of four independent process lines. Common elements such as waste feed cranes, ash conveyors, and boiler feedwater system will have redundant capabilities. Further, the facility will have a condenser capable of wasting all of the facility's steam if the turbine generator is being serviced or its inoperable. These features will minimize the need to bypass waste to a greater extent than any facility developed in this country to date.

The contingency second phase consists of transporting solid waste to the adjacent Central Disposal landfill or the Southern Resource Recovery Facility. Thirdly, if required, solid waste can be transported to the new contingency landfill for disposal. This landfill is currently being developed by the County. Consisting of 589 acres, the landfill site is referenced, for planning purposes, as the Broward Correctional Institute (BCI) site. Its location is shown on Figure 1.1.1 of the Certification Application. Sufficient acreage exists at the site for the developed facility to serve as a long-term contingency disposal landfill during periods of prolonged downtime at the proposed resource recovery facility due to unforeseen circumstances. Because design of the landfill facility will take into consideration the potential for delivery of most or all of the County solid waste stream at any given time (a worst case scenario for contingency planning purposes), sufficient capability to dispose of the potential volume of waste received will exist.

In summary, contingency planning has been, and continues to be, an important part of the overall County solid waste management plan. The capacity of the facility proposed, the flexibility offered by the two-facility resource recovery project approach, and the existence of a permitted landfill site and development of a new landfill to address contingency disposal needs offers a multi-phased contingency program to serve Broward County into the foreseeable future.

3.3 Fuel

3.3.1 General

The fuel to be utilized to generate electricity through the mass-burn technology of the resource recovery facility will be processable solid waste. Processable solid waste is simply that portion of the total incoming waste stream to the facility that can be burned in stoker fired furnaces and waste heat boilers. Processable waste includes: all forms of garbage, commercial waste, rubbish, leaves and brush, paper and cardboard, plastics, wood and lumber, rags, carpeting, a limited amount of tires, wood furniture, mattresses, stumps, wood pallets, timber, tree limbs, ties, and logs, and not separated and recycled at the source of generation, and minor amounts of pathological and biological wastes. Since solid waste is the fuel, the following provides details on the quantity and character of the fuel stream.

Unprocessable Waste is that portion of the County's waste stream that is predominantly non-combustible and therefore should not be processed by a mass burn resource recovery system. Unprocessable Waste will include, but not be limited to, metal furniture and applicances, concrete rubble, mixed roofing materials, noncombustible building debris, rock, gravel and other earthen materials, automobiles, trailers, equipment, wire and cable, and processable wastes (to the extent that it is contained in the normal Unprocessable Waste stream), but excluding hazardous wastes, sludges, pathological and biological wastes, sewage, manure, explosives, chemicals, and radioactive materials.

Separation of waste into processable and unprocessable fractions will be the responsibility of the waste hauler and scalehouse attendant. The two waste streams will be separated at the scalehouse. Vehicles carrying processable waste (most packer trucks) will be directed to the plant tipping floor to unload into the storage pit while vehicles carrying unprocessable waste (most open top vehicles) will be directed to the Central Disposal landfill. Visual inspections will be made of waste deposited at the resource recovery facility by attendants and equipment operators and on a spot basis by supervisory personnel to assure a minimum amount of unprocessable waste is being processed. When necessary, the County will directly contract generators and haulers of waste to secure a better source separation of the two waste streams in order to maximize the processing of waste through the proposed facility.

3.3.2 Waste Stream Control

Broward County currently controls approximately 165,000 tons per year of solid waste. This volume represents waste generated in unincorporated Broward County. Approximately 1,030,000 tons per year of additional Broward County solid waste is delivered to the County owned and operated sanitary landfill at Davie and to the Central Disposal landfill at Pompano, owned and operated by Waste Management Inc. (WMI). The origin of these wastes are the Broward municipalities, of which Fort Lauderdale and Hollywood, Florida, represent the largest fraction. Broward is currently in the process of negotiating an Interlocal Agreement (ILA) with the Broward County League of Cities for waste commitments from the individual Broward municipalities.

3.3.3 Waste Quantities

The following table presents the total quantities of solid waste landfilled at the two existing Broward County landfills from 1981 through 1985.

LANDFILL WASTE QUANTITIES (1981-1985)
(TONS PER DAY)

	Central Disposal Landfill		Davie Landfill		
Year	Garbage	Trash	Garbage	Trash	Total
1981	1429	540	628	207	2804
1982	1540	438	628	171	2777
1983	1663	490	862	205	3220
1984	1694	655	824	223	3396
1985	1973	660	770	250	3653

1. Based upon available waste volume records and an assumed density of 300 pounds per cubic yard.

As indicated on the preceding page, the County's waste stream has been categorized as either garbage or trash. The waste classified as garbage consists of all wastes collected in packer-type vehicles. All garbage wastes are projected to be processable at a resource recovery facility. The tabulated garbage data is based upon actual weigh scale records from 1981 through 1985.

The other listed waste category, trash, consists of wastes collected in roll-off containers, pick-up trucks or other open non-packer vehicles. This waste category includes yard wastes, construction and demolition debris, packaging materials, discarded tires and miscellaneous wastes collected from commercial establishments. Only a fraction of trash is considered to be processable.

3.3.4 Seasonal Variations

The actual waste generation rates in Broward are subject to seasonal variations. The following table notes the variation in solid waste generation on a monthly basis for both garbage and trash. The tabulated figures are based upon 1981 weigh scale data and volume estimates at the Broward County sanitary landfill.

MONTHLY VARIATION OF SOLID WASTE

	Percent of Average Month	
Month	Garbage[1]	Trash[2]
January	81	90
February	86	103
March	108	109
April	104	103
May	102	94
June	111	110
July	110	105
August	98	103
September	110	103
October	96	102
November	94	88
December	100	88

1. Based upon weigh scale data.
2. Based upon volume estimates.

3.3.5 Waste Composition and Type

An estimate of the average composition of the processable portion of the Broward County waste stream is provided in the following table. This table represents a compilation of sampling data obtained from the Central Disposal landfill in Pompano Beach; the County landfill in Davie; Hillsborough County; Daytona Beach; and a range for the State of Florida as published by the Florida Department of Environmental Regulation.

GARBAGE AND TRASH DISTRIBUTION

(As Received Basis)

Fraction	Percent By Weight Of Total Solid Waste Delivered	
	CDL	Davie
Garbage	60	55
Trash	40	45
Processable trash as received	20	17
Processable trash requiring size reduction	4	7
Non-processable trash	16	21

Based on weighing and sampling programs conducted at the Central Disposal landfill, during September 1983 and the County landfill in Davie, during April 1983, the following data were compiled on garbage and trash:

MALCOLM PIRNIE

PHYSICAL COMPOSITION - GARBAGE AND PROCESSABLE TRASH FRACTIONS

(As Received Basis)

Component	Percent by Weight					
	Garbage		Trash		Combined	
	CDL	Davie	CDL	Davie	CDL	Davie
Paper, Cardboard	39	47	9	11	27	36
Plastics	8	9	10	3	5	7
Rubber, Tires	-	-	-	9	-	3
Textiles, Rags, Carpeting and Mattresses	3	2	1	1	2	2
Food Wastes	9	9	-	-	5	6
Garden Wastes, Stumps, Leaves and Brush	21	17	45	36	24	22
Wood	2	3	28	35	8	13
Glass	12	7	-	-	7	5
Metals	6	6	-	-	5	4
Rock, Brick	-	-	-	-	15	-
Other		-	7	5	2	2
	100	100	100	100	100	100

Based on examination of all information compiled, a range of proximate and ultimate analyses is provided in Tables 3.3.5.1 and 3.3.5.2. Based on the results of the laboratory analyses, a conservative BTU waste content range has been established at 4500 to 5000 BTU per pound of processable solid waste.

MALCOLM PIRNIE

TABLE 3.3.5.1

COMPARISON OF PROXIMATE ANALYSES
GARBAGE FRACTION

	Central Landfill September 1983 (1)						Broward County Landfill at Davie April 1983 (2)						Central Landfill August/September 1982 (3)					
	As Received			Dry Basis			As Received			Dry Basis			As Received			Dry Basis		
	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.
% Moisture	20.66	40.46	30.70	0	0	0	19.27	27.98	23.82	0	0	0	37.70	52.21	45.04	0	0	0
% Volatile	41.79	55.58	47.55	60.28	75.36	68.69	51.41	62.03	57.77	71.38	82.39	75.83	NR	NR	NR	48.20	66.50	57.65
% Ash	7.60	25.08	15.21	11.20	34.62	21.97	7.34	19.60	14.35	9.75	24.31	18.82	NR	NR	NR	13.60	36.00	21.73
% Fixed Carbon	2.25	10.13	6.55	3.47	14.53	9.53	0.82	6.90	4.05	1.06	9.05	5.35	NR	NR	NR	15.80	20.40	18.13

Notes:

NR - Not Reported
(1) - Based on twelve (12) samples
(2) - Based on eleven (11) samples
(3) - Based on four (4) samples

TABLE 3.3.5.2

COMPARISON OF ULTIMATE ANALYSES
GARBAGE FRACTION

	Central Landfill September 1983 (1)						Broward County Landfill at Davie April 1983 (2)						Central Landfill August/September 1982 (3)					
	As Received			Dry Basis			As Received			Dry Basis			As Received			Dry Basis		
	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.
% Carbon	26.85	36.60	30.91	41.67	47.44	44.58	24.15	35.90	30.60	31.69	44.80	40.17	NR	NR	NR	36.5	49.50	43.43
% Hydrogen	6.81	8.64	7.68	5.37	7.03	6.14	5.48	7.74	6.80	3.55	6.61	5.53	NR	NR	NR	4.5	5.90	5.1
% Nitrogen	0.31	0.49	0.39	0.43	0.68	0.56	0.25	0.40	0.31	0.31	0.52	0.41	NR	NR	NR	0.26	0.66	0.45
% Sulfur	0.10	0.17	0.13	0.16	0.22	0.18	0.05	0.12	0.09	0.06	0.16	0.12	NR	NR	NR	0.17	1.47	0.81
% Oxygen	34.89	55.79	45.54	14.39	34.25	26.35	40.93	59.40	47.71	27.50	49.08	34.76	NR	NR	NR	20.60	30.6	25.77
% Chlorine	0.11	0.19	0.15	0.17	0.26	0.21	0.10	0.17	0.14	0.12	0.23	0.19	NR	NR	NR	0.40	0.47	0.4
% Fluorine	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.00	0.005	0.003

Notes:

NR - Not Reported
(1) - Based on twelve (12) samples
(2) - Based on eleven (11) samples
(3) - Based on four (4) samples

A high percentage of paper material in the processable waste fraction is highly desirable since it will result in a higher heating value in the refuse which will, in turn, result in more steam and electricity being generated per unit quantity of waste incinerated. From an environmental impact standpoint, the presence of a higher paper fraction in the processable waste is not a cause for concern. Combustion temperatures achieved in the mass-burn resource recovery system in combination with the retention time of waste on the grate leads to very efficient burnout. The facility is required to produce a residue or ash containing no more than 0.3 percent putrescible matter and 4.0 percent combustible matter (dry weight).

Each furnace will be equipped with an electrostatic precipitator for control of particulate emissions. With efficiency of burnout to be achieved at the facility, the exposure of combustion gases containing particulates to high temperatures (greater than 1,800°F) for more than two seconds of residence time, and the efficiency of the particulate control device (greater than 99% removal efficiency) the release of loose paper from the stack is inconceivable.

The Physical Composition Table currently presents the combined composition of the Broward County waste stream. However, it should be noted that the combined column includes data collected during both sampling programs (April and September, 1983). The garbage and trash columns present data collected during the April program only. Hence, the combined totals are not derived from the preceding garbage and trash columns.

3.3.6 Daily Variations

During each week, there traditionally have been large variations in the quantities of solid waste collected on a given day. For example, more waste is generally collected on Mondays and Tuesdays than is collected on Wednesdays and Saturdays.

The Applicant will be responsible for accepting solid waste at the facility in accordance with normal collection and delivery practices of the County and the Contract Communities.

Similarly, during each day, more solid waste can be expected to be delivered at certain times than at other times. Again, the Applicant will be responsible for accepting the County's waste at the facility in accordance with the normal collection and delivery practices of the County and the Contract Communities.

3.3.7 Population Projections

Total population for the County in April 1985 was 1,124,136, as reported by the University of Florida. The Broward County Office of Planning has projected an annual population growth rate of approximately 2 percent resulting in a total Broward County population of 1,268,000 by 1989.

Table 3.3.7.1 presents a range (low, medium and high) of projected population growth from 1985 through 2010, based upon the projections developed by the University of Florida at Gainsville. These projections provide an indication of the type of growth that can be expected in Broward County during the operation of the project.

3.3.8 Facility Sizing

As previously discussed, the County is in the process of negotiating an Interlocal Agreement (ILA) with the Broward County League of Cities. Based upon these negotiations the County has agreed to provide a put-or-pay commitment of 1,300 tpd for the Project.

To allow for future growth and growth rate uncertainty, this Certification Application has been based on an initial installed capacity of 2,200 tpd and a projected ultimate capacity of approximately 3,300.

TABLE 3.3.7.1

BROWARD COUNTY POPULATION PROJECTIONS[1]

	Low	Medium	High
1985	1,103,000	1,149,000	1,194,900
1986	1,121,000	1,177,700	1,234,000
1987	1,139,300	1,207,200	1,274,500
1988	1,158,000	1,237,400	1,316,300
1989	1,177,000	1,268,300	1,359,400
1990	1,196,100	1,300,000	1,404,000
1991	1,211,200	1,328,200	1,445,000
1992	1,226,500	1,357,100	1,487,100
1993	1,242,000	1,386,500	1,530,500
1994	1,257,800	1,416,600	1,575,100
1995	1,273,700	1,447,400	1,621,100
1996	1,286,100	1,475,200	1,663,800
1997	1,298,700	1,503,500	1,707,700
1998	1,311,300	1,532,300	1,752,700
1999	1,324,100	1,561,700	1,799,000
2000	1,337,000	1,591,700	1,846,400
2001	1,342,700	1,614,600	1,885,400
2002	1,348,400	1,637,800	1,925,300
2003	1,354,200	1,661,300	1,966,000
2004	1,360,000	1,685,200	2,007,500
2005	1,365,800	1,709,400	2,050,000
2006	1,371,600	1,734,000	2,093,300
2007	1,377,500	1,758,900	2,137,600
2008	1,383,400	1,784,200	2,182,700
2009	1,389,300	1,809,800	2,228,900
2010	1,395,200	1,835,800	2,276,000

1. Based on University of Florida (Gainsville) projected population data for years 1985, 1990, 1995, 2000, and 2010.

MALCOLM PIRNIE

3.3.9 Residue and Unprocessable Waste Disposal

The County will monitor the delivery of waste to the Project to ensure that processable and unprocessable wastes are directed to proper disposal areas.

Residue generated by the Project and unprocessable waste that cannot be incinerated at the resource recovery facility will be disposed of at the Central Disposal landfill owned by Waste Management adjacent to the facility. The residue and unprocessable waste will be transported to the Central Disposal Landfill in compliance with all applicable codes, rules, and laws regulating such material and its transportation.

The residue generated by the facility must meet the specification of not more than 0.3 percent putrescible matter and 4.0 percent combustible matter (dry weight).

Fugitive emissions will not be observed from the solid waste and residue handling areas of the facility. All solid waste storage and handling will occur in enclosed structures and will be maintained under negative air pressure. All fugitive dusts and odors will be drawn into the furnace and subjected to extremely high temperatures. Residue hauling vehicles will be covered to minimize wind aide drying and dispersion during transport to the landfill.

The ash system proposed for the Project results in a residue containing approximately 10% to 15% bound moisture by weight. This ash is stored in an enclosed building in a concrete bunker. Therefore, the release of ash to the ambient air is minimized and no specific control device is needed.

Hazardous wastes shall not be accepted at the facility. Any hazardous wastes inadvertently accepted at the resource recovery facility will be properly stored and disposed of off-site.

3.4 AIR EMISSIONS AND CONTROLS

3.4.1 AIR EMISSIONS TYPES AND SOURCES

The data presented in this report are based on preliminary or conceptual design of the proposed facility. However, the conceptual design is based on conservative or worst-case assumptions from a potential air quality impact viewpoint, particularly in minimizing the exit gas flow rate and maximizing pollutant emissions.

The North Broward County Resource Recovery (NBCRR) facility is assumed to have nameplate capacity of 2,200 tons per day (TPD). The municipal solid waste (MSW) charging rate and location of the facility is presented in Table 3.4-1. The stack and operating parameters for the projected maximum capacity (i.e., 110 percent of nameplate) of the facility considered in the air quality modeling are presented in Table 3.4-2.

The emission factors for the regulated pollutants that will be emitted from the proposed NBCRR facility are presented in Table 3.4-3. For most of the regulated pollutants, the emission factors are based on estimates derived for resource recovery facilities similar in size to the proposed facility. The emission factors are given as a function of the heat content and amount of MSW burned. These emission factors were obtained from the Broward County Resource Recovery Office (1986) and are based on a review of the literature, such as U.S. Environmental Protection Agency (EPA) AP-42 emission factors and A.D. Little reports, or manufacturer's design specification. The maximum hourly and annual average emission rates for the facility are 110 percent of nameplate capacity.

3.4.2 AIR EMISSIONS CONTROL

Permitted emissions for other MSW-fired resource recovery facilities are presented in Table 3.4-4.

The only applicable emission-limiting standard for MSW-fired facilities is for PM and is contained in the federal NSPS (40 CFR Part 60 subpart E, Standards of Performance for Incinerators) and in the state emission

Table 3.4-1. MSW Charging Rate and Location of the NBCRR Facility

Parameter	Value
<u>MSW Charging Rate</u>	
100 Percent Capacity	2,200 TPD (91.7 tph)
110 Percent Capacity	2,420 TPD (100.8 tph)
<u>Heat Input Rate*</u>	
100 Percent Capacity	825.0 x 10^6 Btu/hr
110 Percent Capacity	907.5 x 10^6 Btu/hr
<u>Location</u>	
Latitude, Longitude	26.29, 87.16°
UTM Zone	17
UTM East, North Coordinate	583.8, 2,907.6 km

*Based on average heating value of MSW of 4,500 Britich thermal units per pound (Btu/lb).

Notes: tph = tons per hour.
Btu/hr = British thermal units per hour.
km = kilometer.

Sources: Malcolm Pirnie, Inc., 1986.
Broward County Resource Recovery Office, 1986.

Table 3.4-2. Stack and Operating Parameters for the Projected Maximum Capacity of the NBCRR Facility Considered in the Air Quality Modeling

Parameter	Value
MSW Charging Rate	
Stack Height	200 ft (61.0 m)
Stack Diameter	9.84 ft (4.92 m)*
Exit Gas Temperature	
Projected	430°F (494 K)†
Modeled	400°F (477 K)
Exit Gas Flow Rate	
Projected	456,280 acfm†
Modeled	342,210 acfm
Exit Gas Velocity	
Projected	100 fps (30.5 m/s)†
Modeled	75 fps (22.9 m/s)

*Effective diameter for 4 flues. Each flue will have a diameter of 4.92 ft (1.5 m).
†Based on 110 percent of nameplate capacity and at 9.2-percent CO_2.

Note: m = meters.
acfm = actual cubic feet per minute.
m/s = meters per second.

Sources: Malcolm Pirnie, Inc., 1986.
Waste Management, 1986.
Broward County Resource Recovery Office, 1986.

MALCOLM PIRNIE

Table 3.4-3. Pollutant Emission Factors for the Proposed NBCRR Facility

Pollutant	Emission Factor ($lb/10^6$ Btu)	Emission Factor (lb/ton of MSW)*
Particulate Matter (PM)	0.046	0.42
Sulfur Dioxide (SO_2)	0.55	4.95
Nitrogen Dioxide (NO_2)	0.56	5.0
Carbon Monoxide (CO)	0.09	0.80
Volatile Organic Compounds (VOC)	0.013	0.12
Lead (Pb)	0.002	0.018
Fluorides (F^-)	0.018	0.16
Sulfuric Acid Mist (H_2SO_4)	0.047	0.42
Hydrogen Sulfide (H_2S)	NA	NA
Total Reduced Sulfur	NA	NA
Reduced Sulfur Compounds	NA	NA
Asbestos	NA	NA
Beryllium (Be)	9.3×10^{-7}	8.4×10^{-6}
Mercury (Hg)	0.00092	0.0083
Vinyl Chloride	NA	NA
Benzene	NA	NA
Radionuclides	NA	NA
Inorganic Arsenic (As)	3.1×10^{-5}	2.8×10^{-4}

NA = Not applicable.
*Based on average heating value of MSW of 4,500 Btu/lb.

Source: Broward County Resource Recovery Office, 1986.

Table 3.4-4. BACT Determinations for MSW, Florida Resource Recovery Facilities and Proposed BACT Emission Limit for the North Broward Facility

Pollutant	Emission Limit (in lb/ton of MSW unless otherwise indicated)*						
	Hillsborough	Pinellas Units 1 & 2	Pinellas Unit 3	McKay Bay	Bay County	Dade County	Proposed for North Broward
Particulate Matter (PM)	0.021 gr/dscf	0.08 gr/dscf	0.03 gr/dscf	0.67†	0.56	0.08 gr/dscf	0.02 gr/dscf
Sulfur Dioxide (SO_2)	3.2	1.9	1.9	4.1	2.8	—	4.95
Nitrogen Oxides (NO_x)	3.0	—	3.0	7.2	2.2	—	5.0
Carbon Monoxide (CO)	1.8	—	1.5	0.4	11.4	—	0.8
Volatile Organic Compounds (VOC)	0.2	—	0.3	0.2	0.232	—	—
Lead (Pb)	0.048	—	0.03	0.074	0.0036	—	0.018
Mercury (Hg)	~~0.00052~~ .0052 lb/ton	—	0.01	0.0996	0.00171	—	0.0083
Beryllium (Be) ($x\ 10^{-6}$)	13.1	—	1.3	6.2	48	—	8.4
Fluorides (F^-)	0.06	—	0.1	0.1	—	—	0.16
Sulfuric Acid Mist (H_2SO_4)	0.0768	—	—	—	—	—	0.42
Inorganic Arsenic (As) ($x10^{-4}$)	—	—	—	—	—	—	2.8

*Multiply by 0.11 to obtain lb/10^6 Btu based on an average heating value of 4,500 Btu/lb.
†Required LAER due to non-attainment area.
Note: Emissions given in gr/dscf are corrected to 12 percent CO_2.
Sources: Hillsborough County, Energy Recovery Facility, Case No. 83-19, Conditions of Certification, Revised 11/6/84
Pinellas County, Resource Recovery Facility, Case No. PA 78-11 and PA 83-18, Conditions of Certification.
FDER Permit AC 29-47277, McKay Bay
FDER Permits AC 03-84703 and AC03-84704, Bay County
Metropolitan Dade County Resource Recovery Facility, Case No. 77-607 Conditions of Certification

limiting and performance standards for incinerators (17-2.600(1) F.A.C.). Both regulations limit particulate emissions to 0.08 grains per dry standard cubic feet (gr/dscf) (corrected to 12 percent CO_2).

In June 1984, EPA proposed revisions to New Source Performance Standards (NSPS) for industrial/commercial/ institutional steam-generating units that would limit particulate emissions to 0.1 lb/10^6 Btu for MSW-fired boilers capable of combusting more than 100 x 10^6 Btu/hr heat input (49FR25102). This regulation is currently under review with final promulgation set for late 1986.

Emission-limiting standards for SO_2 are scheduled for proposed promulgation in June 1986. Emission of SO_2 from MSW-fired steam generation units will not be included in this proposal since sulfur content of MSW is low relative to other fuels (Burn, 1986).

The sections that follow present the emissions and control technology proposed as BACT for the facility.

3.4.2.1 PARTICULATE MATTER (PM)

The proposed PM emission limit is 0.02 gr/dscf, corrected to 12 percent CO_2 (or 0.046 lb/10^6 Btu), based upon operation of a well designed electrostatic precipitator (ESP). This level of control is substantially lower than the federal NSPS and Florida emission standards of 0.08 gr/dscf and is consistent with two recent permit approvals in Florida (Pinellas County Unit 3 and Bay County). In addition, this limitation results in emissions well below the proposed NSPS for PM of 0.1 lb/10^6 Btu.

PM generated by the combustion of MSW will be minimized through a combination of combustion controls/boiler design and installation of an ESP. PM exiting the boilers in the exhaust gases will be controlled by use of ESPs. The combustion design will be the mass-burn type and capable of firing as-received MSW on a continuous-feed basis without auxiliary fuel firing. The combustion efficiency will yield a residue, or ash, containing not more than 4-percent combustibles and 2-percent noncombustibles. This design requirement will serve to minimize the generation of ash.

ESPs are the traditional method of controlling PM emissions from incinerators and steam-generating units. ESPs use the principle of attraction between electrostatically charged objects and an uncharged ground or an oppositely charged object. In 1907, Cottrell developed the first successful application of ESP. The first ESP used for collecting fly ash was installed 1923 and since then thousands have been installed.

Operation of a modern ESP includes the following sequence:

1. Generation of a high-voltage corona discharge;
2. Bombardment and charging of particles in the gas stream;
3. Migration of charged particles to a collection plate; and
4. Transfer of collected particles from the ESP for disposal.

The generation of a high-voltage corona discharge is accomplished with transformer-rectifiers which energize discharge and grounded electrodes. The flue gas is passed between the electrodes, and the PM in the gas stream becomes charged. The charged particles then migrate to the collecting electrodes, where they are periodically displaced and removed to collecting hoppers, and subsequently removed by the fly ash handling system.

ESP design depends on the electrical properties of the particulate being collected, flue gas volume and properties, and the desired collection efficiency. ESP efficiency is affected by the alignment of ESP electrodes, the specific collection area (SCA), the flow pattern of gas through the ESP, the rapping method, and the electrical characteristics of the corona discharge system.

The ESP will be complete with all appurtenances, structural supports, foundations, external and internal walkways, platforms, access stairways, fly-ash hoppers with discharge, air-lock valves; power and control wiring; induced-draft fan; and other accessories for a complete operation system. Each ESP will be a multi-field type with the output of each ESP flowing into a single flue. The fields will be sized adequately considering both the volume of gases and amount of excess air. The temperature of flue gases entering the ESP will be below 550 degrees Fahrenheit (°F) and at least 40°F above the dew-point temperature. The maximum ESP-inlet temperature is based on operating experience from ESPs at incinerator installations (EPA, 1979) and Waste Management's preliminary design.

ESP gas distribution will be accomplished via a low-velocity, multiple-vane system or a perforated-plate system. ESP collecting surface rapping will be by shaft-driven rotary hammers. Solenoid impact or vibration rapping generally is not acceptable. ESP high-voltage systems will have stainless-steel electrodes. Weighted-wire systems gernerally are not acceptable. ESP discharge electrode rapping will be accomplished by shaft-mounted rotary hammers; solenoid impact or vibrating rapping is not acceptable.

ESP fly ash hopper heaters will be the resistance type, extending two thirds of the ash-hopper height from the bottom of the hopper (to prevent blockage). The fly-ash handling systems include, but are not limited to, screw conveyors inside precipitator hoppers, rotary or double-flap air lock valves, and dry-drag-type transfer conveyors.

3.4.2.2 SULFUR DIOXIDE (SO_2)

SO_2 formation in a MSW-fired furnace is a function of the sulfur content of the fuel and the chemical form in which it occurs. Sulfur in refuse occurs in several organic forms as sulfides, sulfates, and sulfites. Only the sulfate fraction can be converted to SO_2 during combustion.

Literature has suggested that a significant fraction of the total sulfur in the fuel is retained in the furnace bottom ash and in the fly ash. The form of the sulfur emitted in the flue gas exiting the ESP is predominantly SO_2, with a very small percentage as gaseous sulfur trioxide and H_2SO_4.

There are no state emission-limiting standards for SO_2 from MSW-fired boilers. NSPS have not been promulgated or proposed which would regulate SO_2 emissions from the proposed facility.

From Table 3.4-4, SO_2 emissions for other permitted or proposed MSW-fired facilities in Florida have ranged from 1.9 to 4.1 lb/ton MSW. According to Florida Department of Environmental Regulation (DER), the lower factor of 1.9 pounds per ton (lb/ton) (Pinellas County Unit 3) has not been achieved based on source testing, and a revised higher emission rate of 4.1 lb/ton MSW has been requested. According to Camp, Dresser & McKee, Inc. (CDM) (1984), stack test results from six mass-burn facilities located throughout the United States showed SO_2 emissions ranging from 1.0 to 4.0 lb/ton. Three other facilities were permitted at rates ranging from 2.0 to 4.0 lb/ton. EPA (1984a) cites an average emission factor of 2.5 lb/ton. Henningson, Durham, and Richardson (HDR) (1985b) surveyed a total of 16 incinerators throughout the world and reported SO_2 emissions ranging from 0.8 to 6.5 lb/ton. An A.D. Little (1981) literature survey found emissions to range from 0.77 to 4.6 lb/ton.

EPA (1982) has reported an average SO_2 emission rate of 0.492 $lb/10^6$ Btu for overfeed stoker mass-burn facilities. California Air Resources Board (CARB) (1984) reported emission rates from mass-burn and Refuse-Derived Fuel (RDF) facilities ranging from 0.02 to 1.19 $lb/10^6$ Btu, with average emissions of about 0.3 $lb/10^6$ Btu.

These data illustrate that MSW is a non-homogeneous fuel and that sulfur content and SO_2 emissions can vary over a wide range. Nevertheless, SO_2 emissions from MSW firing are lower compared with other solid and liquid fuels.

By comparison, NSPS for fossil-fuel-fired boilers and electric utility steam generators firing solid fuel [40 CFR 60, Subparts D and D(a)] would allow up to 1.2 lb $SO_2/10^6$ Btu. No SO_2 emission-limiting standard currently exists or are proposed for incinerators or MSW-fired boilers. In addition, BACT determination for the south Broward Resource Recovery Projects (DER, 1985) states:

> Burning low sulfur fuel is one acceptable method of controlling SO_2 emissions. The installation of flue gas desulfurization to control SO_2 emissions is not warranted when burning MSW.

The proposed BACT emission limit for the north Broward Resource Recovery project is 0.55 lb/10^6 Btu which is consistent with the upper end of available data and represents a maximum limit. This emission limit is equivalent to about 0.12 percent sulfur in fuel with no sulfur retained in the ash and is about the same as observed in 23 samples taken from the Central and Davie Landfills in 1983. Depending upon the amount of sulfur retained in the ash, actual SO_2 emissions will vary but would likely be less than the proposed limit.

3.4.2.3 NITROGEN OXIDES (NO_x)

Factors that influence NO_x emissions from MSW-fired furnaces include furnace design, excess air, and combustion temperatures. Formation of NO_x is due to "thermal" NO_x formation and "fuel" NO_x formation. Thermal NO_x is produced by oxidizing the nitrogen contained in the combustion air at high temperatures. Fuel NO_x is formed when the nitrogen contained in the fuel is oxidized to NO_2. Fuel NO_x is most likely the dominant formation mechanism. The level of NO_x produced, therefore, is a function of temperature and excess air (oxygen availability).

Review of Table 3.4-4 shows NO_x emission factors for other MSW-fired facilities in Florida have ranged from 2.2 to 7.2 lb/ton. CDM (1984) reported emission factors for five operating MSW-fired facilities in the United States ranging from 2.1 to 4.6 lb/ton. Three other facilities were permitted at a rate of about 3.0 lb/ton. EPA (1984a) also cites a factor of 3.0 lb/ton. CARB (1984), in its exhaustive study of MSW-fired facilities throughout the United States, found NO_x emissions ranging from 0.08 to 0.47 $lb/10^6$ Btu for mass-burn and RDF facilities. EPA (1982) found an average emission rate of 0.308 $lb/10^6$ Btu for overfeed stoker mass-burn units. HDR (1985b) surveyed 11 MSW incinerators throughout the United States and found NO_x emissions ranging between 1.1 and 4.7 lb/ton. A.D. Little's (1981) survey showed emissions to range from 0.7 to 4.4 lb/ton.

An emission limit of 0.55 $lb/10^6$ Btu (approximately 5 lb/ton MSW) is proposed as Best Available Control Technology (BACT). Although this emission rate is consistent with the upper end of available data, it provides a reasonable, conservative safety factor for possible variations in fuel composition and furnace operation. In addition, application of NO_x control technology would tend to create greater emissions of CO and VOC. Also, the desire to achieve combustion conditions [$\geq$1,000 degrees Celsius (°C) for at least 1 second] that allow complete destruction of chlorinated orgnaics could be inhibited using NO_x control technology. A proposed limit of 0.55 $lb/10^6$ Btu is lower than the NSPS NO_x limit for solid-fuel-fired, steam-generating facilities [i.e., NSPS for fossil-fuel-fired boilers codified in 40 CFR 60, Subparts D and D(a) limit NO_x (as NO_2) emissions to 0.7 and 0.6 $lb/10^6$ Btu, respectively, for bituminous coal firing].

3.4.2.4 CARBON MONOXIDE (CO)

CO emissions from MSW-fired furnaces are a product of incomplete combustion conditions, and solid-waste composition is not an important factor. The quantity of CO produced is dependent upon the design and operation of the furnace. Advancements in combustion technology have resulted in a decreasing trend in CO emissions from MSW furnaces.

High excess air and proper air/fuel mixing are important factors in reducing CO emissions. Even when operated at high excess air levels, CO can be generated from localized areas of the furnace where oxygen deficiencies may exist. Modern MSW-fired furnaces are designed to maximize air and fuel mixing and complete combustion through proper design and refuse feed control.

Table 3.4-4 shows that CO emission factors approved for other similar facilities in Florida have ranged from 0.4 to 11.4 lb/ton.

CMD (1984) reported CO emission factors ranging from 0.62 to 4.3 lb/ton for over eight operating or permitted MSW-fired facilities located throughout the United States. EPA (1984a) cites a factor of 35 lb/ton, and A.D. Little (1981) reported a range of 0.05 to 34.8 lb/ton based on a literature survey. However, these higher factors are based on an old-design (prior to 1970) furnace. The CARB (1984) study found CO emissions from MSW-fired facilities ranging from 0.18 to 2.0 lb/10^6 Btu for mass-burn and RDF units.

For the north Broward Resource Recovery Project, a CO emission limit of 0.09 lb/10^6 Btu (approximately 0.8 lb/ton) is proposed.

3.4.2.5 LEAD (Pb)

Emissions of Pb from MSW-fired furnaces is primarily a function of the Pb content of the MSW. Pb is a trace metal found in solid waste. Pb is melted and then volatilized in the combustion process but then is deposited onto the fly ash or condensed into the solid phase after leaving the furnace. The Pb is thus susceptible for collection by an ESP or other particulate control device. Pb emission factors for Florida resource recovery facilities, shown in Table 3.4-4, range from 0.0036 to

0.074 lb/ton. A.D. Little (1981) reports emission rates ranging from 0.04 to 0.34 lb/ton. The CARB (1984) study showed a range of from 5,600 to 16,000 micrograms per megaJoules (μg/MJ) (0.013 to 0.37 lb/10^6 Btu) with an average of 9,531 μg/MJ (0.022 lb/10^6 Btu).

A BACT emission limit of 0.002 lb/10^6 Btu (approximately 0.02 lb/ton MSW) is proposed for the NBCRR facility. A high efficiency ESP will be installed to meet this limit (see section 3.4.2.1).

3.4.2.6 MERCURY (Hg)

Hg is present in solid waste in trace quantities. Because of its low boiling point and high vapor pressure, it will exit MSW-fired furnace primarily in the vapor phase. As a result, Hg emissions are not generally capable of control by the PM control device. Florida MSW-fired facilities have accepted Hg emission factors ranging from 0.00171 to 0.0996 lb/ton MSW. The McKay Bay emission factor of 0.0996 lb/ton, which is considerably higher than the other values, is considered unrepresentative of Hg content in Florida MSW. CARB (1984) found rates ranging from 17 to 390 μg/MJ (0.000039 to 0.000905 lb/10^6 Btu), with an average emission level of 157 μg/MJ (0.00036 lb/10^6 Btu).

Based on this information, an Hg emission factor of 0.00092 lb/10^6 Btu was considered to represent a reasonable upper limit for the NBCRR facility. The NBCRR facility will not burn any sewage sludge, which may contain Hg in higher concentrations than MSW.

3.4.2.7 BERYLLIUM (Be)

Be emissions from MSW-fired furnaces, like Pb emissions, are emitted primarily in the solid phase and are dependent upon trace element content of the MSW and PM control device collection efficiency.

Be emission rates for Florida MSW-fired facilities range from 1.3 x 10^{-6} lb/ton to 48 x 10^{-6} lb/ton. The CARB (1984) study reported a range of from less than 0.08 to 3.0 μg/MJ (0.19×10^{-6} to 7.0×10^{-6} lb/10^6 Btu). Based upon these studies and the application of a high efficiency ESP, a Be factor of 9.3×10^{-7} lb/10^6 Btu (approximately 8.4×10^{-6} lb/ton MSW) is proposed for BACT.

3.4.2.8 FLUORIDES (F^-)

F^- emissions from MSW-fired furnaces are a function of the F^- content of the MSW. Little is known about concentrations of F^- in MSW. F^- can be emitted as a gaseous product or be bound or absorbed in the fly ash. In the gaseous form, the F^- will be emitted primarily as hydrogen fluoride (HF).

Little test data is available for F^- emissions from MSW-fired furnaces. Previously permitted Florida facilities have used emission factors ranging from 0.06 to 0.1 lb/ton. A.D. Little (1981) reported HF emissions from MSW incinerators, based upon a literature survey, to range from 0.1 to 0.12 lb/ton (only two facilities reporting). The CARB (1984) study found limited test data (only one facility) and reported emissions were 0.003 lb/10^6 Btu.

Sufficient data is not available on fluorine content in Broward County MSW to estimate emissions. However, limited data suggest an emission limit of 0.018 lb/10^6 BTU (0.16 lb/ton) is appropriate as BACT.

3.4.2.9 SULFURIC ACID (H_2SO_4) MIST

H_2SO_4 mist emissions are expected from MSW-fired facilities due to small quantities of sulfur trioxide (SO_3) associated with the SO_2 emissions. The SO_3 reacts with water droplets in the flue gases to form H_2SO_4 mist. H_2SO_4 formation will depend upon the amount of SO_3 present and the degree of oxidation to H_2SO_4. Test data for H_2SO_4 from MSW-fired furnaces is not available from literature. Only one Florida facility is currently permitted for this pollutant (Table 3.4-4). This factor is 0.077 lb/ton

MSW. An emission rate of 0.047 lb/10^6 Btu (approximately 0.42 lb/ton) MSW) is proposed for the Broward County Resource Recovery project.

3.4.2.10 INORGANIC ARSENIC (As)

As is another trace element present in MSW which will be emitted primarily in the solid phase and, therefore, is susceptible to collection by the PM control device. The only information available concerning As emission rates is from the A.D. Little (1981) and CARB (1984) studies. A.D. Little found four MSW facilities in the literature which had reported As emissions, which ranged from 0.0001 to 0.0014 lb/ton. The CARB study reported uncontrolled As emissions ranging from 16 to 1,763 µg/MJ (0.000037 to 0.0041 lb/10^6 Btu), with an average of 469 µg/MJ (0.0011 lb/10^6 Btu). Based on using a high efficiency ESP, an emission rate of 3.1×10^{-5} lb/10^6 Btu (approximately 2.8×10^{-4} lb/ton MSW) is proposed for the Broward County project.

3.4.3 <u>BEST AVAILABLE CONTROL TECHNOLOGY</u>

3.4.3.1 EVALUATION OF ALTERNATIVE CONTROL TECHNOLOGIES

The following subsections describe and evaluate control technologies that could provide a higher degree of control for the air-regulated pollutants. In some cases, similar control technology can remove a variety of air pollutants. For these common pollutant control applications, a variety of air pollutants will be grouped together.

The economic and energy information presented was developed from:

1. Cost of Sulfur Dioxide, Particulate Matter and Nitrogen Oxide Controls on Fossil Fuel Fired, Industrial Boilers, EPA, August 1982, EPA-450/3-82-021; and

2. Costs of Particulate Matter Controls for Non-Fossil Fuel Fired Boilers, EPA, February 1983, EPA-450/3-83-004.

These references include algorithms for calculating annualized control costs (Table 3.4-5) and provides the most applicable information for developing economic and energy estimates on MSW-fired steam generators. In addition, the algorithms developed in these documents have been used by EPA to assess economic impacts of various proposed emission-limiting standards. However, the costs developed from these documents are generic and should be considered as a lower level estimate of actual costs.

All costs presented in this section are adjusted to mid-1985 using the Chemical Engineering Plant Cost Index.

The alternative technologies considered are presented in Table 3.4-6. Tables 3.4-7 and 3.4-8 present the annualized costs and energy usage, respectively, of the alternative technologies considered in the BACT evaluation.

Particulate Matter (PM)

Application of a higher level of particulate control than that proposed has been permitted as either BACT or lowest achievable emission rate (LAER) in various states (EPA, 1985b). In general, these permits restricted emissions to 0.015 gr/dscf corrected to 12 percent CO_2. This level of control will be evaluated in the evaluation of alternative control technologies (see also Table 4-4).

PM control technologies for MSW firing in furnaces and boilers has been extensively examined by EPA (1979) in its review of the NSPS for incinerators, by EPA (1982) in its Background Information Document (BID) for nonfossil-fuel-fired industrial boilers, by CARB (1984), and in the several applications for MSW-fired facilities in Florida as discussed in Section 3.4.2. The major conclusions of these studies are summarized below:

1. Three types of control devices are potentially applicable to MSW-fueled facilities: ESP, fabric filters, and venturi scrubbers.

Table 3.4-5. Components of Capital, Operating, and Maintenance and Total Annualized Costs.

<u>Capital Costs</u>	
Direct Costs--Equipment and Installation	
Indirect Costs	
Engineering	
Construction and Field Expenses	
Construction Fees	
Start Upcosts	
Performance Costs	
Contingencies	
Working Capital	
<u>Operating and Maintenance Costs</u>	
Supervision	
Maintenance	
Electricity	
Water	
Solid Waste	
Chemicals	
Indirect (Overhead)	
<u>Total Annualized Costs</u>	
Operating Costs	
Capital Charges	
Capital Charges	

Source: EPA, 1982.

MALCOLM PIRNIE

Table 3.4-6. Alternative Control Technologies Evaluated

	Alternative Control		
Pollutant	Type	Level of Control	Decrease of Pollutant Emission Over Proposed BACT (TPY)
Particulate	ESP/FF	0.015 gr/dscf (corrected to 12 percent CO_2)	33.4
SO_2	Dry Scrubber	70 Percent	1,114
F-	Dry Scrubber	90 Percent	122
H_2SO_4 Mist	Dry Scrubber	90 Percent	47
Pb	ESP/FF	See Particulate	1.9
Be	ESP/FF	See Particulate	9×10^{-4}
As	ESP/FF	See Particulate	0.03
Hg	Dry Scrubber	50 Percent	1.4

ESP/FF = Electrostatic Precipitator/Fabric Filter

Source: KBN, 1986.

Table 3.4-7. Annualized Costs of Proposed and Alternative Control Technologies Evaluated

Control	Annualized Cost	Annualized Cost Difference Over Proposed Level of Control
Proposed--ESP @ 0.02 gr/dscf corrected for 12 percent CO_2	$2,670,000	N.A.
ESP/Fabric Filter @ 0.015 gr/dscf corrected for 12 percent CO_2	$2,778,000 - 3,131,000	$108,000 - 461,000
Dry Scrubber/Fabric Filter	$5,548,000 - 8,827,000*	$2,878,000 - 6,157,000*

*Includes lost revenue; based on 10-percent downtime due to dry scrubber operation.

NA = Not applicable.

Source: KBN, 1986.

MALCOLM PIRNIE

Table 3.4-8. Energy Usage of Proposed and Alternative Control Technologies Evaluated

Control	Energy Usage (kwh/year)	Energy Usage Differance (kwh/year)
Proposed--ESP @ 0.02 gr/dscf corrected to 12 percent CO_2	4,590,000	N.A.
ESP/Fabric Filter @ 0.015 gr/dscf	4,880,000	+290,000
Dry Scrubber/Fabric Filter	5,096,900	+506,900

NA = Not applicable.

Source: KBN, 1986.

MALCOLM PIRNIE

2. ESP and fabric filters can generally be designed to achieve the same level of control. However, fabric filters can generally provide a greater degree of emission reduction than ESP for particles less than 2 μm. ESPs provide a much better emission reduction than do venturi scrubbers.
3. Fabric filters and venturi scrubbers have not been extensively tested and proven on MSW boilers. Those which have been installed on MSW boilers have encountered severe operational and maintenance problems that include: fires and corrosive attack (fabric filters); plugging, severe corrosion, and wastewater treatment (venturi scrubbers).
4. The ESP is by far the most common control technique for control of PM at these facilities and are well proven.
5. Venturi scrubbers require much greater energy requirements in order to provide adequate PM control, operating and maintenance costs are high, and the liquid scrubber waste must be treated and/or disposed.
6. ESP and fabric filters have low energy requirements, and the waste by-product can be handled in a dry manner.
7. ESP have been proven capable of meeting the proposed BACT emission limit of 0.02 gr/dscf, corrected to 12 percent CO_2. A fabric filter would also be capable of meeting the 0.02 gr/dscf limit, but this control technique has not been proven as reliable as the ESP.
8. ESP have been used on both MSW-burning facilities, and have been proven reliable.
9. All operating, permitted or proposed MSW-fired facilities in Florida have selected the ESP as the PM control device.

Based on these data, the venturi scrubber was not considered as a PM control alternative. The ESP is considered to be the most proven control device for limiting PM emissions from MSW-fired facilities. A fabric filter is also capable of achieving this level of control, and energy and environmental impacts are similar to the ESP. However, significant questions arise with the fabric filter regarding their reliability and maintenance when MSW is fired. Applications of fabric filters to MSW-fired facilities generally require flue gas quenching to insure particles still under combustion do not reach the filters and cause a fire.

Economic Impacts--The costs of the alternative control are shown in Table 3.4-9 and will range from \$3,240/ton of PM removed (ESP) to \$13,800/ton of PM removed (ESP). Over the proposed level of control, a 4- to 17-percent increase is annualized cost is calculated.

Environmental Impacts--Table 3.4-10 presents the improvement in air quality from installing a higher level of control (i.e., 0.015 gr/dscf corrected to 12 percent CO_2). As shown by Table 3.4-9, the maximum predicted air quality improvement for PM will be less than 1 percent of the PSD increments on AAQS.

Energy Impacts--The installation of an ESP to achieve the alternate PM control level will increase annual average energy usage by 290,000 kilowatt hours (kwh) or by about 6.3 percent. The installation of a fabric filter will be higher in overall energy usage. Although cost algorithms are not available to make an estimate, the differential in energy usage is expected to be low.

Sulfur Dioxide (SO_2), Fluorides (F^-), and Sulfuric Acid (H_2SO_4) Mist

Currently, there are no emission-limiting standards which apply to SO_2, H_2SO_4, F-, or HCl emissions from MSW-fired boilers. NSPS have not been proposed or promulgated (nor will they be in the near future) (Burn, 1986), and there are no FDER emission-limiting standards.

Emissions of SO_2, H_2SO_4, and F- can all be controlled by the same control technique. H_2SO_4 emissions are a function of SO_2 emissions; thus, controlling SO_2 also controls H_2SO_4.

Table 3.4-9. Economic Evaluation for Alternative Control Technologies for BACT Pollutants

Pollutant	Annualized Cost Differential ($)	Cost Per Ton Pollutant Removed ($/Ton)	Difference From Proposed Control Level (%)
PM	108,000 to 461,000	3,240 to 13,800	4 to 17
SO_2	2,878,000 to 6,157,000	2,580 to 5,530	108 to 231
F-	2,878,000 to 6,157,000	23,600 to 50,500	108 to 231
H_2SO_4 Mist	2,878,000 to 6,157,000	61,200 to 131,000	108 to 231
Pb	108,000 to 461,000	56,840 to 242,600	4 to 17
Be	108,000 to 461,000	1.2×10^8 to 5×10^8	4 to 17
As	108,000 to 461,000	3.6×10^6 to 1.5×10^7	4 to 17
Hg	2,878,000 to 6,157,000	2.1×10^6 to 4.4×10^6	108 to 231

Source: KBN, 1986.

MALCOLM PIRNIE

Table 3.4-10. Environmental Impacts of Alternative Control Technologies for BACT Pollutants Evaluation

Pollutant	Improvement in Air Quality* ($\mu g/m^3$) 3-hour	24-hour	Annual	Maximum Percentage of PSD Increment	Maximum Percentage or AAQS
PM	1.0	0.2	0.03	0.5	0.1
SO_4	24.2	5.8	0.7	6.4	2.2
F-	1.0	0.3	0.03	--	--
H_2SO_4 Mist	2.6	0.6	0.07	--	--
Pb	0.04	0.01	<0.01	--	<0.5
Hg	0.03	<0.01	<0.01	--	--

*Decrease in maximum predicted ground-level concentrations based on results for the proposed plant presented in Section 7.0.

Source: KBN, 1986.

Pre- and post-combustion control technolgies for SO_2 have been developed for fossil-fuel-fired boilers, but not for MSW combustion, primarily due to the low sulfur content of the MSW fuel and resultant low SO_2 emissions. Pre-combustion controls include using low sulfur fuel and physical or chemical cleaning. MSW would be classified as a low-sulfur fuel. MSW, at a maximum of 4.9 lb/ton SO_2 emissions, would yield about 0.55 lb/10^6 Btu. By comparison, high sulfur (2.5 percent coal and low sulfur (0.5 percent) coal would yield about 5.0 lb/10^6 Btu and 1.0 lb/10^6 Btu, respectively. Physical/chemical cleaning methods to remove sulfur from MSW fuel are not known to have been developed, primarily because there has not been a need for such methods. Consequently, pre-combustion sulfur and F- removal from MSW is considered unnecessary and technologically infeasible at this time.

Post-combustion controls for SO_2 include wet scrubbers and dry scrubbers, the latter requiring a PM collection device to remove the dry waste material from the flue gases. Wet scrubbing systems developed to date include limestone/lime, sodium, and dual alkali scrubbing. Dry scrubbing systems are based upon calcium or sodium scrubbing and evaporation of the scrubbing medium, leaving behind a dry waste material which can be captured in an ESP or fabric filter. Because of the relative low sulfur content of MSW dry scrubbing can be less costly than wet scrubbing.

CARB (1984) presented a comprehensive review of SO_2, H_2SO_4 and F- control technologies for MSW-fired facilities. This study concluded that both wet and dry scrubbing systems have been satisfactorily proven for application to MSW-fired facilities. Depending on scrubber technology and scrubbing media, SO_2, H_2SO_4, and F- (as HF) removal efficiencies can range from 70 to more than 90 percent depending upon design.

The major drawbacks of all these systems are:

1. The capital and annual operating costs of a wet or dry scrubbing system is large.

2. These systems are rarely available 100 percent of the time due to operational problems. Either costly redundancy built into the system is required to ensure 100 percent availablility or loss of plant operation will occur.
3. They produce large amounts of solid and/or liquid wastes which must be treated and/or disposed. Proper disposal to avoid related environmental contamination is required.
4. Energy usage of these systems is high, typically requiring 10 to 15 percent of the energy output of the facility.
5. Large amounts of water may be required for the scrubber systems.

Much of the information in this report was developed from MSW-fired facilities in Japan and Europe with no major facilities in the United States.

Because a number of facilities have been recently permitted (but not yet operated) that use dry scrubbing, this alternative control technology was evaluated (see Table 3.4-6) for SO_2, H_2SO_4 and F- removal.

Economic Impacts--The annualized cost differential between the proposed level of control (i.e., ESP) and dry scrubbers is from $2,878,000 to $6,157,000 or about 108 to 231 percent higher than the ESP alone (see Table 3.4-6). Pollutant removal costs are estimated to be $2,580/ton to $5,530/ton for SO_2, $23,600/ton to $50,500/ton for F^-, and $61,200/ton to $131,000/ton for H_2SO_4. When combined, the pollutant removal costs is $2,240/ton without lost revenue. Including lost revenue, the costs for removal would escalate to approximately $4,800/ton.

Environmental Impacts--Improvements in maximum predicted impacts at the alternative control level, i.e., approximately 0.17 lb $SO_2/10^6$ Btu, will not exceed 7 percent of the PSD increment and 3 percent of the AAQS (Table 3.4-10).

MALCOLM PIRNIE

Federal or State of Florida AAQS do not exist for F- or H_2SO_4. Acceptable ambient concentration (AAC) levels for toxic and hazardous pollutants are currently under development by DER (Mora and Gunn, 1985). For pollutants such as HF or H_2SO_4, AAC levels of approximately 1/300 of the Threshold Limit Value (TLV) promulgated by the American Conference of Government and Industrial Hygienist is being considered by DER for new source BACT. A comparison of these developmental AAC levels and predicted concentrations are presented below.

Pollutant	TLV† ($\mu g/m^3$)	AAC ($\mu g/m^3$)	Predicted Concentration ($\mu g/m^3$)
HF	2,452	8.2	0.03
H_2SO_4	1,000	3.3	0.3

† 8-hour, time-weighted average.

As illustrated above, even at the maximum predicted concentration level (i.e., 3-hour averaging time) the AAC currently under development will not be exceeded.

Energy Impacts--The energy associated with the alternative control is calculated to increase by approximately 506,900 kwh/year or approximately 11 percent higher.

Nitrogen Oxides (NO_x)

NO_x emissions from MSW combustion processes result for the oxidation of nitrogen compounds in the combustion air (thermal NO_x) and in the fuel (fuel NO_x). Thermal NO_x formation is highly dependent on temperature and design of the combustion unit (i.e., heat release rates, residence time, and oxygen availability). However, according to CARB (1984), 75 to 80 percent of the NO_x generated from refuse burners is a result of fuel NO_x. Fuel NO_x is influenced by the fuel nitrogen content, combustion air distribution, and excess air. The amount of NO_x released from a specific source, both thermal and fuel, is, therefore, a function of the design and operation of the combustion unit.

NO_x emissions from combustion sources can potentially be reduced by three methods:

1. Reduce fuel nitrogen content,
2. Combustion design, and
3. Flue gas denitrification.

Reducing fuel nitrogen content is not presently feasible. No cost-effective method has been found to separate out materials in MSW which are high in nitrogen content. Flue gas denitrification processes have not been demonstrated on MSW combustion systems on a commercial scale. One process, the selective non-catalytic reduction (SNCR) method, has been applied to four refuse burning facilities in Japan (CARB, 1984). However, operating problems are reported, which reflects the developmental status of this technology. Flue gas denitrification processes were not considered further as BACT for the NBCRR facility due to the lack of reliable, full-scale operating experience and the large costs associated with such a process.

No emission-limiting standards or NSPS exist for NO_x emissions from MSW-fired facilities. The proposed BACT for NO_x emissions due to MSW firing, and the only feasible control alternative, is combustion controls.

More extensive NO_x controls, such as low excess air firing, would tend to create greater emissions of CO and VOC and possibly chlorinated organics due to incomplete combustion; therefore, more extensive NO_x controls would be counterproductive to the design of the facility. Thus, the combustion design will attempt to limit NO_x, CO, and VOC emissions to the greatest extent possible within practical limits. As a consequence, a more detailed evaluation of NO_x control will not be performed.

The analysis of the air quality impacts of the proposed NO_x emission levels demonstrated minimal NO_x impacts as a result of operation of the proposed facility at the proposed BACT emission rate. This proposed BACT is also consistent with control technologies and BACT determinations for all operating and permitted MSW facilities in Florida.

Carbon Monoxide (CO)

CO emissions from burning are a result of incomplete combustion. High combustion temperatures, good mixing, and proper air/fuel ratios allow optimum control of CO. However, high combustion temperatures and high excess air rates can lead to greater levels of NO_x; therefore, a tradeoff must exist between NO_x and CO emissions.

No emission-limiting standards exist for CO emissions from MSW-fired facilities. Specific add-on technologies for control of CO have not been developed or incorporated into operating or permitted MSW-fired facilities designs. As a result, the selected BACT for the proposed facility is good combustion control and furnace design. This BACT is consistent with CO control techniques employed at all operating or permitted MSW-fired facilities in Florida, including four facilities located in O_3 nonattainment areas (two in Hillsborough County, one in Pinellas County, and one in Dade County). The proposed BACT emission rate for CO is 0.09 lb/Btu of MSW. The air quality impact of the proposed CO BACT emission level is predicted to be insignificant.

Lead (Pb), Beryllium (Be), and Arsenic (As)

As discussed in Section 3.4.2, small quantities of Pb, Be, and As are present in MSW, and a portion of these metals will be volatilized and then condensed or absorbed upon other particulates contained in the flue gas exhaust stream. Thus, control of PM will also control these trace metals. No emission-limiting standards have been promulgated or proposed to restrict emissions of these trace metals from MSW-fired boilers.

The ESP or fabric filter was chosen as an alternative control technology of PM emissions.

Economic Impacts--As shown in Table 3.4-9, the cost for an alternative level of control for these pollutants exceeds $50,000/ton for Pb and $1 million/ton for both Be and As. Even when combined with PM, the overall cost of additional control exceeds $3,000/ton.

Environmental Impacts--The maximum predicted impact of Pb emissions at the BACT emission rate is small and well below the AAQS (see Table 3.4-10). No Florida AAQS exist for Be or As, although the State of New York has established an AAQS of 0.01 micrograms per cubic meter (ug/m^3), monthly average, for Be. The maximum predicted 24-hour impact of Be due to the proposed NBCRR is 0.000014 ug/m^3, well below the New York State standard.

Energy Impacts--The energy impacts associated with an alternative control are presented in Table 3.4-8.

Mercury (Hg)

No emission-limiting standards for Hg emissions from MSW-fired facilities exist. As discussed in Section 3.4.2, emissions of Hg from MSW combustion will occur primarily in the gaseous phase and, therefore, will not be controlled by the ESP or fabric filter. Although no known technology currently exists to remove trace quantities of Hg in flue gas streams, some type of scrubbing device may remove a fraction of the Hg emitted. Therefore, for the purpose of this analysis, it was assumed that installation of a dry scrubber system would remove 50 percent of the emitted Hg.

Economic Impacts--The economic impacts of potentially controlling 50 percent of the emitted Hg using dry scrubbing is estimated to exceed

Table 3-2. Stack and Operating Parameters for the Projected Maximum Capacity of the NBCRR Facility Considered in the Air Quality Modeling

Parameter	Value
MSW Charging Rate	
Stack Height	200 ft (61.0 m)
Stack Diameter	9.84 ft (4.92 m)*
Exit Gas Temperature	
Projected	430°F (494 K)†
Modeled	400°F (477 K)
Exit Gas Flow Rate	
Projected	456,280 acfm†
Modeled	342,210 acfm
Exit Gas Velocity	
Projected	100 fps (30.5 m/s)†
Modeled	75 fps (22.9 m/s)

*Effective diameter for 4 flues. Each flue will have a diameter of 4.92 ft (1.5 m).
†Based on 110 percent of nameplate capacity and at 9.2-percent CO_2.

Note: acfm = actual cubic feet per minute.

Sources: Malcolm Pirnie, Inc., 1986.
Waste Management, 1986.
Broward County Resource Recovery Office, 1986.

Table 3-3. Pollutant Emission Factors for the Proposed NBCRR Facility

Pollutant	Emission Factor ($lb/10^6$ Btu)	Emission Factor (lb/ton of MSW)*
Particulate Matter (PM)	0.046	0.42
Sulfur Dioxide (SO_2)	0.55	4.95
Nitrogen Dioxide (NO_2)	0.56	5.0
Carbon Monoxide (CO)	0.09	0.80
Volatile Organic Compounds (VOC)	0.013	0.12
Lead (Pb)	0.002	0.018
Fluorides (F^-)	0.018	0.16
Sulfuric Acid Mist (H_2SO_4)	0.047	0.42
Hydrogen Sulfide (H_2S)	NA	NA
Total Reduced Sulfur	NA	NA
Reduced Sulfur Compounds	NA	NA
Asbestos	NA	NA
Beryllium (Be)	9.3×10^{-7}	8.4×10^{-6}
Mercury (Hg)	0.00092	0.0083
Vinyl Chloride	NA	NA
Benzene	NA	NA
Radionuclides	NA	NA
Inorganic Arsenic (As)	3.1×10^{-5}	2.8×10^{-4}

NA = Not applicable.
*Based on average heating value of MSW of 4,500 Btu/lb.

Source: Broward County Resource Recovery Office, 1986.

\$2 million/ton. The cost for removal including SO_2, F, and H_2SO_4 would not change by adding Hg removal.

Environmental Impacts--An AAQS has not been established for Hg. However, EPA (1984b) developed a guideline of 0.1 ug/m^3, 30-day average, as part of the development of the National Emission Standards for Hazardous Pollutants (NESHAP) for Hg. (The NESHAP for Hg does not apply to the proposed NBCRR because sewage sludge will not be burned at the facility.) The predicted maximum impact of the proposed facility is 0.014 ug/m^3, 24-hour average. This short-term maximum is well below the 30-day average guideline.

3.4.3.2 RATIONALE FOR PROPOSED BACT

The proposed BACT for NBCRR consists of:

1. A high efficiency ESP to control PM, as well as Pb, Be, and As, to 0.02 gr/dscf corrected to 12 percent CO_2;
2. Combustion controls to control NO_x and CO emission; and
3. Fuel content to control SO_2 and H_2SO_4 emission.

The alternative control technologies evaluated in Section 3.4.3.1 provide the basis for comparing economic, environmental, and energy impacts with the proposed BACT. The subsections that follow evaluate the significance of that information.

Economic Impacts

The economic information presented in Section 3.4.3.1 was, in part, presented in dollars per ton of pollutant removal. EPA, in evaluating the cost/ benefits of various control technologies, uses such economic indicators. Currently, EPA does not have a standard policy for evaluating pollutants but uses a range of values depending on the pollutant and the governmental organization performing the evaluation (Burn, 1986 and Stevenson, 1986). Recent EPA proposed regulations (EPA, 1984c) and general policy guidance (Burn, 1986 and Stevenson, 1986) indicate that the following ranges are applicable for PM and SO_2:

PM: \$2,000[1] - \$3,000[2]/ton pollutant removed

SO_2: \$1,250[3] - \$2,000[2]/ton pollutant removed

1. Proposed NSPS for non-fossil fuel boilers;
2. EPA Office of Air Quality Planning and Standards; and
3. Office of Policy, Planning, and Evaluation.

As discussed in Section 3.4.3.1, the costs developed for the alternative control evaluation were based upon information developed by EPA. Sufficient experience has not been developed in the installation of dry scrubbers on MSW-fired facilities to accurately estimate costs. Costs estimated for the scrubber/fabric filter combination were adapted from fossil fuel burning technology. Using the algorithms developed for fossil fuel technology alone would tend to underestimate the costs for MSW applications since the greater variability in MSW fuel characteristics compared with fossil fuel must be considered in design. Consequently, the estimated costs for the dry scrubber/fabric filter are generic and conservative (i.e., underestimating costs). A comparison of the costs and the EPA criteria clearly indicate that the cost of the alternative control technologies evaluated are significant and above the cost which is reasonable.

Environmental Impacts

As discussed in Section 3.4.2, the improvement in air quality by applying the alternative control technologies are considered insignificant. The maximum improvement by applying alternative controls as a percentage of PSD increment is 6.4 percent for SO_2 and 0.5 percent for PM. For the proposed control level, less than 10 percent of the PSD increments for SO_2 and 1 percent of the PSD increments for PM will be consumed at the maximum impact receptor. Clearly, the primary purpose of BACT will be met with the proposed control because sufficient PSD air quality

MALCOLM PIRNIE

increments are available for potential future economic growth without significantly degrading air quality.

The predicted environmental impacts as a percentage of the AAQS are also minimal with SO_2 and PM concentrations less than 5 percent of the applicable standard. Improvements in air quality with alternative technology will be less than 2.5 percent of the applicable AAQS for these pollutants. For Pb, the air quality impacts associated with the proposed BACT will be less than 1 percent of the AAQS.

The impacts associated with the non-criteria pollutants (i.e., F^-, H_2SO_4, Be, As, and Hg) are well below the currently recognized health or impact levels.

Recent permits issued in other states (especially the northeastern United States and western United States) have required control of "acid gases" (including SO_2, F^-, and H_2SO_4). Dry scrubbing has been the most common control technology selected in these cases. However, the controls were generally associated with LAER determinations and possibly reflect greater air quality impacts associated with the site-specific meteorology. This latter effect is illustrated in Table 3.4-11 which compares the environmental impacts from the proposed BACT for NBCRR with a similar-sized, MSW-fired facility (with a dry scrubber located in Connecticut). As indicated in this comparison, the impacts in Connecticut are from 3.5 to 7 times that of south Florida. Furthermore, in many cases the permitted emissions are not significantly lower (with a dry scrubber) than that proposed for NBCRR. This comparison illustrates that the application of more stringent control of MSW-fired facilities for other states is not directly comparable to that proposed for NBCRR because of site-specific conditions.

Energy Impacts

The increased energy usage caused by the alternative BACT control technologies is considered moderate.

Table 3.4-11. Comparison of Proposed BACT Environmental Impacts with Alternative Control Technology—Dry Scrubber Permitted in Connecticut

Pollutant	North Broward County				Bridgeport, Connecticut			
	Proposed Emissions* (TPY)	Air Quality Impact 3-hour	Air Quality Impact 24-hour	Air Quality Impact Annual	Proposed Emissions† (TPY)	Air Quality Impact 3-hour	Air Quality Impact 24-hour	Air Quality Impact Annual
PM	134	2.9	0.7	0.061	145	23.2	2.65	0.6
SO_2	1,592	34.6	8.4	0.73	1,367	219	25	6
F^-	52	1.1	0.27	0.024	19.5	3.1	0.4	0.09
H_2SO_4 Mist	136	3.0	0.72	0.062	132	21.1	2.4	0.6
Pb	5.8	0.13	0.031	0.0027	2.8	0.5	0.05	0.01
Hg	2.7	0.058	0.014	0.0012	3.9	0.6	0.07	0.02

*Based on 642,400 tons of MSW.
†Based on 821,250 tons of MSW.
**Predicted highest, second-highest 3- and 24-hour and highest annual concentrations due to proposed emissions only (see Section 7.0 for proposed NBCRR facility).

Sources: Connecticut DEP, 1985b.
ESE, 1986.

MALCOLM PIRNIE

Conclusion

Based on an evaluation of the proposed and alternative control technologies, the proposed control technology is considered the appropriate choice for BACT. This conclusion is based on the relative significance of economic impacts associated with the low air quality benefits and greater proven reliability of the proposed technology. Energy impacts do not appear to vary significantly for the technologies evaluated. The matrix illustrates the engineering conclusion drawn from the data presented in the BACT section and Table 3.4-12.

Table 3.4-12. BACT Conclusion Matrix for Alternative Control Technologies Evaluated

Summary of Impacts of Alternative Control Technologies		
Economic	**Environmental**	**Energy**
Significant o Cost greater than EPA criteria o Dry scrubbing will cost from $4.5 to $9.6/ton of MSW or approximately 16 to 34 percent of tipping fee	No significant improvement for proposed BACT o Small percentage (<7 percent) of PSD increment consumed o Impacts small (<3 percent) compared to AAQS	Moderate increase in energy consumption over proposed from 6.3 to 11 percent

Source: KBN, 1986.

3.4.4 Design Data for Control Equipment

The following information in Table 3.4.4.1 is based on the design data provided by Waste Management, Inc. for the electrostatic precipitators proposed for the control of air emissions at the northern resource recovery facility.

3.4.5 Design Philosophy

As previously mentioned on Section 3.4.3.1, Particulate Matter, USEPA data suggests that the electrostatic precipitator is highly proven for municipal incinerator application and is capable of achieving PM emission levels well below NSPS and State of Florida emission standards. Figure 3.4.5.1 presents the mass and energy balance.

3.5 Plant Water Use

A quantitative water use diagram for the plant is provided in Figure 3.5.1. Presented in this figure are estimated quantities of water flows to and from the various plant water systems including the heat dissipation system, sanitary wastewater system, potable water systems, and process water system. The source of all plant intake water is from the County treated sewage effluent and potable water supply.

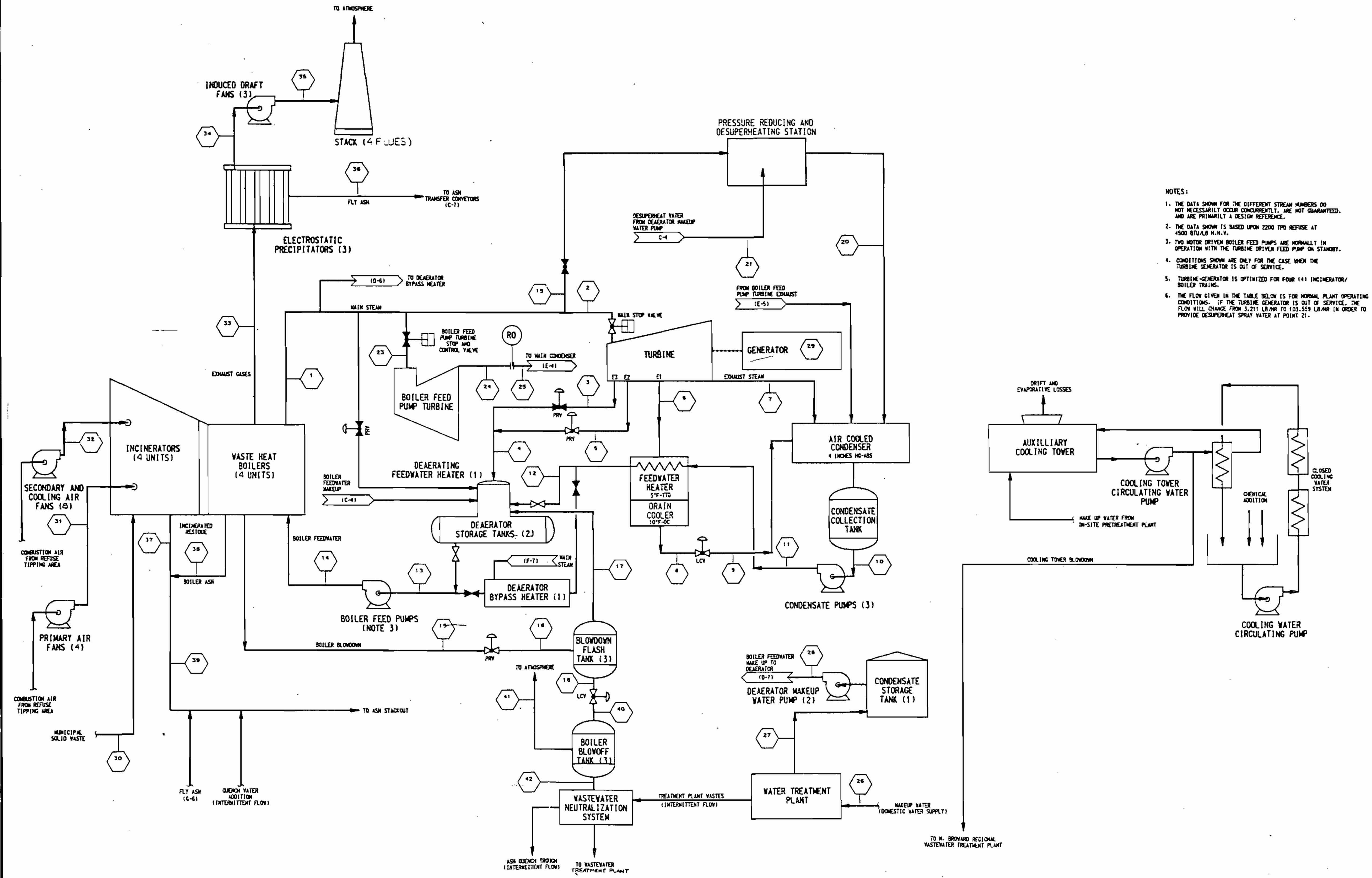
The water balance diagram referred to above is a preliminary one. Water balance data will be refined upon development of detailed design plans.

Data regarding wastewater flows from process line and sanitary sewer sources as provided the vendor includes the following:

	Average	Peak
Process Water Requirements	11,491 gal/wk	12,640 gal/wk
Sewer Discharges	3,661 gal/wk	2,927 gal/wk

Approximately 60 employees will be required at the facility over a 24 hour seven day period. An estimated 120 gallons of potable water per day per capita will be consumed at the plant.

FIGURE 3.4.5.1



NOTES:

1. THE DATA SHOWN FOR THE DIFFERENT STREAM NUMBERS DO NOT NECESSARILY OCCUR CONCURRENTLY, ARE NOT GUARANTEED, AND ARE PRIMARILY A DESIGN REFERENCE.
2. THE DATA SHOWN IS BASED UPON 2200 TPD REFUSE AT 4500 BTU/LB H.H.V.
3. TWO MOTOR DRIVEN BOILER FEED PUMPS ARE NORMALLY IN OPERATION WITH THE TURBINE DRIVEN FEED PUMP ON STANDBY.
4. CONDITIONS SHOWN ARE ONLY FOR THE CASE WHEN THE TURBINE GENERATOR IS OUT OF SERVICE.
5. TURBINE-GENERATOR IS OPTIMIZED FOR FOUR (4) INCINERATOR/BOILER TRAINS.
6. THE FLOW GIVEN IN THE TABLE BELOW IS FOR NORMAL PLANT OPERATING CONDITIONS. IF THE TURBINE GENERATOR IS OUT OF SERVICE, THE FLOW WILL CHANGE FROM 3,211 LB/HR TO 103,559 LB/HR IN ORDER TO PROVIDE DESUPERHEAT SPRAY WATER AT POINT 21.

DESIGN REFUSE

PARAMETER	STREAM NUMBER / UNITS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
FLOW	LB/HR	471,520	471,520	32,869	32,869	-	49,049	389,602	49,049	49,049	438,651	438,651	438,651	476,235	476,235	4715
ENTHALPY	BTU/LB	1416.2	1415.5	1178.1	1178.1	-	1102.1	989.7	181.9	181.9	93.4	93.4	207.1	245.2	251.8	542.6
TEMPERATURE	°F	842	837	324	271	-	213.7	125.4	135.4	135.4	125.4	125.4	208.7	276.1	280.0	544.6
PRESSURE	PSIA	965	915	95	46.3	-	15.2	1.97	15.2	8.2	1.97	100	90	46.3	1381	1000

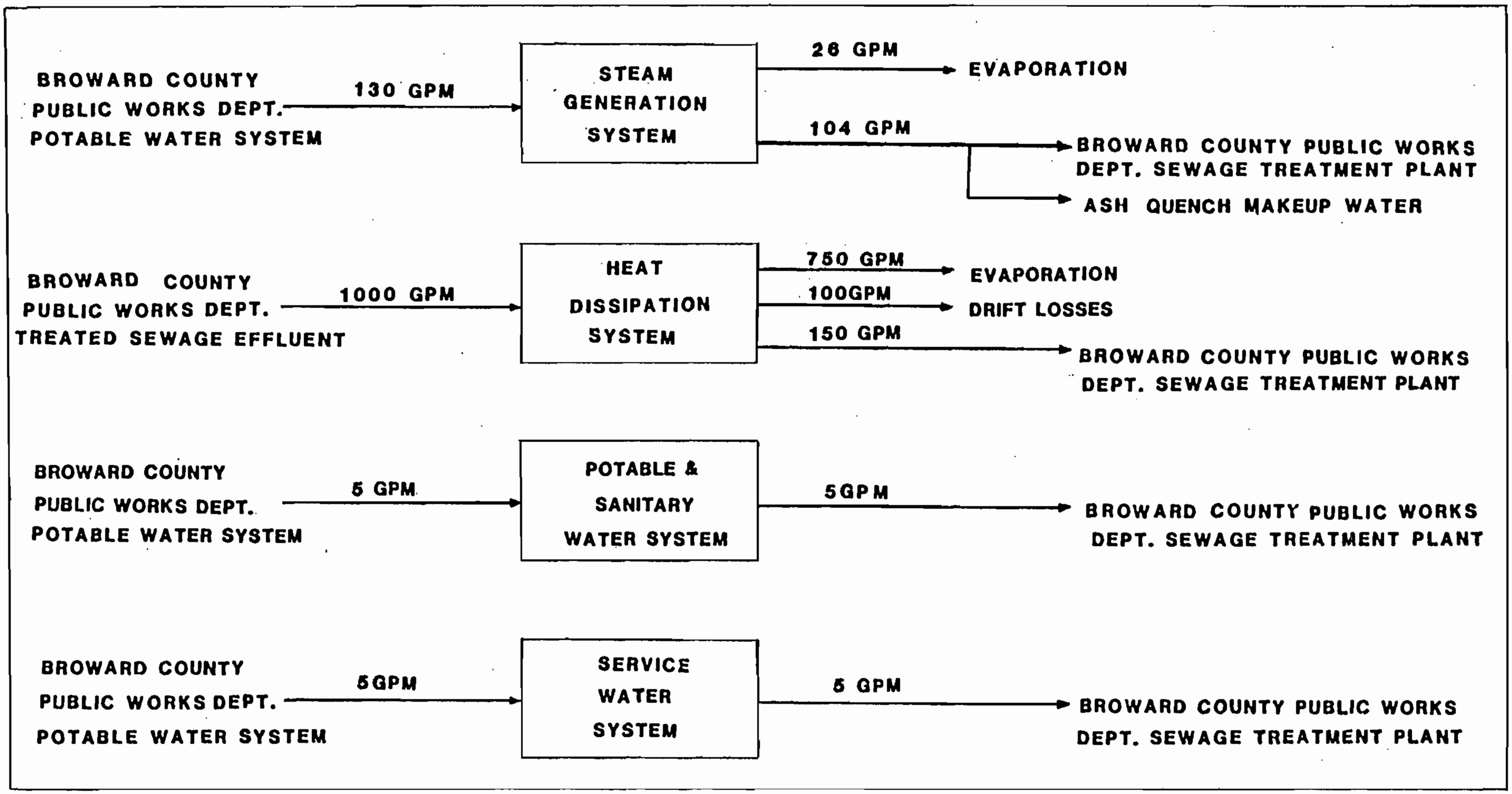
PARAMETER	STREAM NUMBER / UNITS	16	17	18	19 (SEE NOTE 4)	20 (SEE NOTE 4)	21 (SEE NOTE 4)		23 (SEE NOTE 3)	24 (SEE NOTE 3)	25 (SEE NOTE 3)	26	27	28 (SEE NOTE 6)	29	30
FLOW	LB/HR	4715	1504	3211	471,520	571,868	100,348		8690	8690	8690	130 GPM	130 GPM	3211	52.3 MWe	183,300
ENTHALPY	BTU/LB	542.6	1173.2	247.2	1415.4	1172	28.3		1415.5	1247	1247	-	-	28.3	-	4500 HHV
TEMPERATURE	°F	278	278	278	837	274.5	60		837	457.2	450.2	50	60	60	-	-
PRESSURE	PSIA	47.7	47.7	47.6	915	45	85		915	25	1.97	-	-	85	-	-

DESIGN REFUSE

PARAMETER	STREAM NUMBER / UNITS	31	32	33	34	35	36	37	38	39	40	41	42
FLOW	LB/HR	754,930	503,287	1,417,500	1,408,175	1,408,175	9325	6657	17,950	24,607	3211	221	2990
ENTHALPY	BTU/LB	-	-	-	-	-	-	-	-		247.2	1150.5	180.2
TEMPERATURE	°F	80	80	350	350	356	-	-	-	-	212	212	212
PRESSURE	PSIA	10.4"w.g.	5.1"w.g.	-	-8.0"w.g.	1"w.g.	-	-	-	-	14.7	14.7	14.7

BROWARD COUNTY

WASTE TO ENERGY PROJECT
MASS & ENERGY BALANCE
4 LINE - DRY



BROWARD COUNTY

WATER BALANCE

FIGURE 3.5.1

TABLE 3.4.4.1

ENVIRONMENTAL DATA

Air Pollution Control Equipment
(Electrostatic Precipitators)

Four (4) electrostatic precipitators, arranged for outdoor installation, each containing three electrical fields.

Design

Volume (lb/hr at operating conditions)	367,330
Temperature (°F at design conditions)	660
Gas velocity ft/sec	2.35 to 2.90
Maximum outlet dust burden	0.03 grains/dscf corrected to 12% CO_2

A comparison with pre- and post-construction is presented in Table 3.5.1. Temporary shutdowns of the plant would result only in potable and sanitary water flow (5 gpm) and service water flow (5 gpm). Upon abandonment, no water flows would occur.

No water data will be required by the South Florida Water Management District (SFWMD) for this project because the Broward County Utilities Division (BCUD) will supply all water requirements and treat all wastewaters prior to ocean outfall discharge.

3.5.1 Heat Dissipation System

3.5.1.1 System Design

The heat dissipation system will employ a conventional circulating water, evaporative type cooling tower. Make-up water will be effluent from the sanitary waste treatment plant nearby and will be tertiary treated prior to being used as make-up. Cooling tower blowdown will be returned to the sanitary waste treatment plant. Cooling tower data is shown in Table 3.5.1.1.

3.5.1.2 Source of Cooling Water

Cooling water requirements will be provided with secondary treated sewage effluent from Broward County Utilities Division. Pumps and pipeline will be installed to transport the effluent from the County plant to the project site. The cooling system will require 1,000 gpm maximum makeup at a maximum temperature of 90°F. Analyses of the potable water and secondary treated effluent are included in Tables 3.5.1.2 and 3.5.1.3. The secondary treated effluent will be treated on the project site to remove phosphorus to less than 1.0 ppm prior to entering the cooling system.

3.5.1.3 Dilution System

Since all cooling water intake will be from the Broward County Utilities Division, no dilution of intake water will occur. All discharge waters will be disposed of directly to the County sanitary sewer with no dilution. All wastewater discharges will meet the pretreatment standards of the Broward County Utilities Division.

3.5.1.4 Blowdown, Screened Organisms, and Trash Disposal

Since all water will be supplied by the Broward County Utilities Division, screened organisms and trash associated with intake screens will not be a problem. Boiler and cooling tower blowdown will be discharged directly to the County sewer main.

TABLE 3.5.1

PRECONSTRUCTION AND POST CONSTRUCTION COMPARISON

Operational Phase	Evaporation gpm (1)	Diversion gpm	Blowdown gpm (2)	Seepage gpm	Other gpm (3)
Preconstruction	0	0	0	0	0
Post Construction	776	0	254	0	110

Notes:

1. Boiler and cooling tower evaporation.
2. Boiler and cooling tower blowdown.
3. Cooling tower drift losses, sanitary waste and service water waste.

MALCOLM PIRNIE

TABLE 3.5.1.1

COOLING TOWER DATA

(a)	Heat dissipated:	375,000,000 BTU/HR
(b)	Water withdrawn:	1,000 gpm make-up
(c)	Consumtpive use:	1,000 gpm make-up
(d)	Design size:	400,000,000 BTU/HR
(e)	Location of tower:	Within 100 ft. of the turbine-generator building.
(f)	Blowdown:	150 gpm
(g)	Physical Characteristics:	Redwood construction on a concrete basin 3 cells, each with a _*_ horsepower induced draft fan. Overall size: _*_ ft. long x _*_ ft. wide x _*_ ft. high
(h)	Temperature changes and hold-up times in the cooling ponds:	Not applicable
(i)	Rate of evaporation:	750 gpm
(j)	Dams and dikes for cooling reservoir:	Not applicable
(k)	Water intake structure:	Not applicable
(l)	Point of discharge	Not applicable

*To be determined during final design.

TABLE 3.5.1.2

BROWARD COUNTY UTILITIES DIVISION
TYPICAL POTABLE WATER ANALYSIS

pH	9.1	
Total Combined Cl_2	2	mg/l
Total Hardness	63	mg/l as $CaCO_3$
Alkalinity	24	mg/l
Ca Hardness	39	mg/l
Calcium	22.5	mg/l
Magnesium	1.6	mg/l
Bicarbonate	20.9	mg/l as $CaCO_3$
Carbonate	2.5	mg/l
Hydroxide	0.6	mg/l
Sodium	11	mg/l
Chloride	22	mg/l
Color	8-10	Color Units
Foaming Agents	0.14	mg/l
Sulfate	27	mg/l
TDS	115	mg/l
Nitrate	0.04	mg/l as N
Fluoride	0.9	mg/l as N
Turbidity	0.3	NTU
Iron	<0.01	mg/l
Manganese	<0.01	mg/l
Arsenic	<0.001	mg/l
Cadmium	<0.001	mg/l
Barium	<0.001	mg/l
Zinc	<0.02	mg/l

TABLE 3.5.1.3

SECONDARY TREATED EFFLUENT RESULTS
BROWARD COUNTY UTILITIES DIVISION NORTH REGIONAL
WASTEWATER TREATMENT PLANT
FEBRUARY 22, 1984

Dissolved Oxygen	3.0 - 3.2 mg/l
pH	6.9 - 7.1
Temperature	77 - 79°F
Total Chlorine	.6 - 2.12 mg/l
Free Chlorine	0
Total Coliform	320 colonies/100 mls
Fecal Coliform	<10 colonies/100 mls
BOD	3.9 mg/l - nitrogen inhibited
COD	42 mg/l
Dissolved Solids	195 mg/l no NaCl
Suspended Solids	8 mg/l
Turbidity	3.7 NTU's
Total Nitrogen	9.34 mg/l as N
Total Phosphorus	3.47 mg/l as P
Cyanide	.02 mg/l
Oil & Grease	<1 mg/l
MEAS	.114 mg/l
Phenols	.0054 mg/l
Arsenic	<.001 mg/l
Cadmium	<.005 mg/l
Chromium	<.05 mg/l
Copper	<.02 mg/l
Lead	<.1 mg/l
Mercury	<.0002 mg/l
Nickel	<.04 mg/l
Silver	<.01 mg/l
Zinc	<.06 mg/l

3.5.1.5 Injection Wells

Injection wells are not included in the design of the facility.

3.5.2 Domestic/Sanitary Wastewater

All sanitary wastewaters from the facility will be discharged directly to the County sewer main without pretreatment. Approximately 5 gpm of typical human sanitary wastewater will be discharged.

3.5.3 Potable Water Systems

All potable water requirements will be supplied by the Broward County Utilities Division. No treatment is anticipated for non-processed water applications (i.e., sanitary uses). Approximately 5 gpm of typical human sanitary wastewater will be discharged without treatment directly to the County sewer main.

3.5.4 Process Water Systems

Boiler water makeup (130 gpm) and service water (5 gpm) will be supplied from the Broward County Utilities Division potable water system. Service water (i.e., site washdown water, etc.) will receive no pretreatment. Boiler water makeup will be demineralized and then chemically treated prior to entering the boilers as follows:

- o Typical Boiler Water Treatment
  - Iron Dispersant
  - Phosphate
  - Hydrazine
  - Neutralizing/Filming Amines
- o Demineralizer Regeneration
  - H_2SO, (leaves H^+ ion on cation resin: H^+ ion replaces cations in water)
  - NaOH (leaves OH^- ion on anion resin: OH^- ion replaces anions in water)

Process wastewater will be neutralized and either used as ash quench makeup water or discharged to the County sanitary sewer.

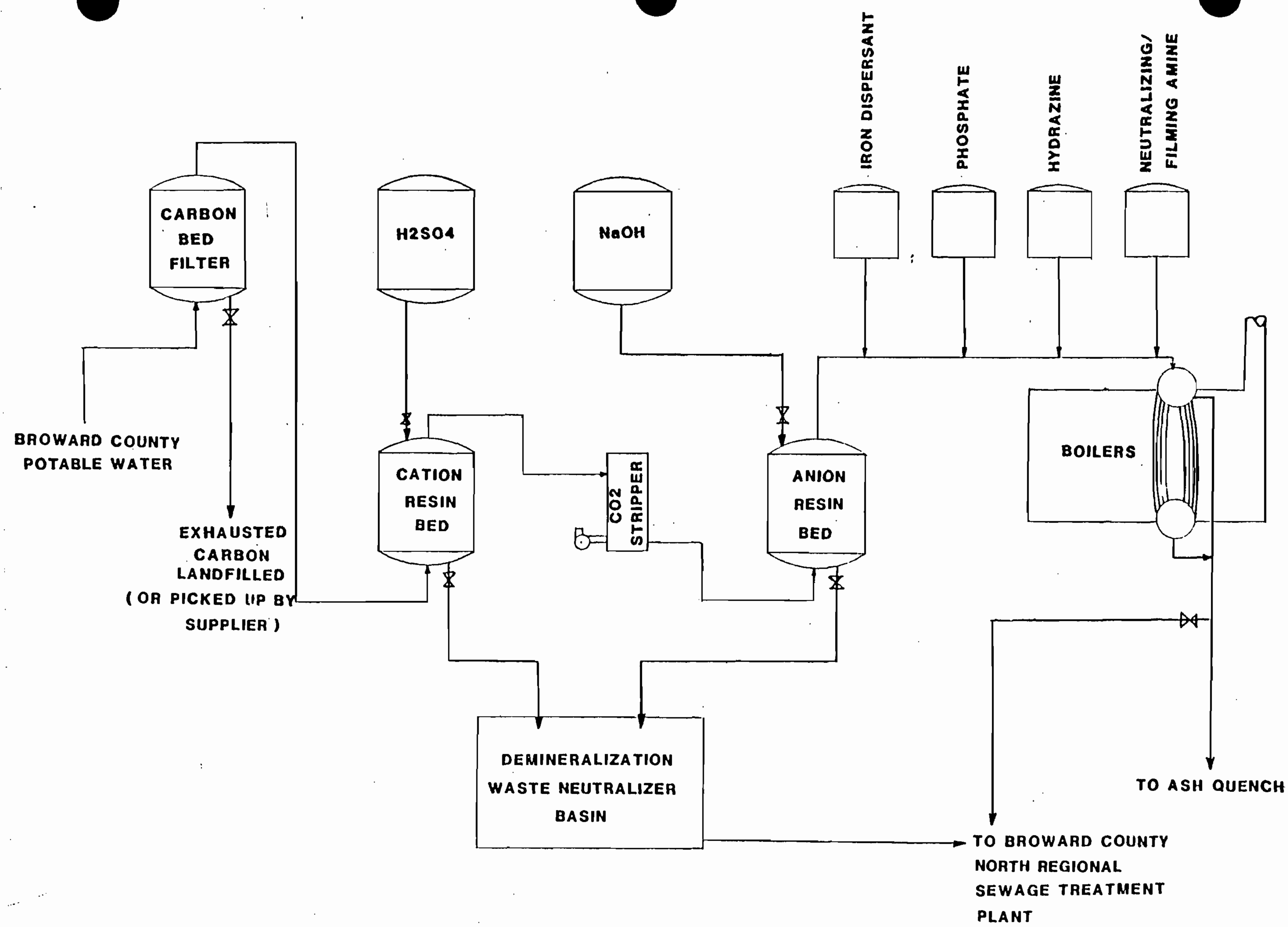
Cooling tower water makeup (1000 gpm) will be supplied from the Broward County Utilities Division secondary treated sewage effluent. The effluent will be pretreated with alum and clarified prior to going to the cooling tower. The recirculating cooling water will be chemically treated as follows:

- o Typical Cooling Water Treatment
  - Phosphate
  - Acrylate
  - Azole
  - Chlorine (Periodic doses)
  - Biocide (Periodic doses)
  - H_2SO_4 (pH control)

Sludge from secondary treatment water will be discharge to the adjacent landfill. Cooling tower blowdown will be discharged directly to the county sewer.

3.6 Chemical and Biocide Waste

Provided in Figure 3.6.1 is a flow diagram of the chemical waste associated with the boiler water makeup. Potable water from Broward County Utilities Division will be passed through an activated carbon bed to remove chlorine and organics. Exhausted carbon will be picked up by the vendor supplying the replacement carbon or the exhausted carbon can be landfilled (final arrangements have not been determined at this time). The water will then be passed through resin beds to remove cations (Na, Ca, Si, Fe, etc.) and anions (CO_3, SO_4, CI, etc.). Sulfuric acid will be used to regenerate the cation resins by replacing the cations with hydrogen ions. Caustic will be used to regenerate the anion resins by replacing the anions with hydroxyl ions. The acid and caustic wastes will be discharged to a basin, neutralized and then discharged to the County sewer. The demineralized water will then be chemically treated with an iron dispersant (prevents iron deposition), phosphate (prevents catonic deposition),



BROWARD COUNTY

FLOW DIAGRAM OF THE CHEMICAL WASTE
ASSOCIATED WITH
THE BOILER WATER MAKEUP

FIGURE 3.6.1

hydrazine (chemically converts oxygen to water) and a neutralizing/filming amine (protective filming agent for metals). Blowdown from the boiler will be used as ash quench water makeup with any excess going directly to the County sewer.

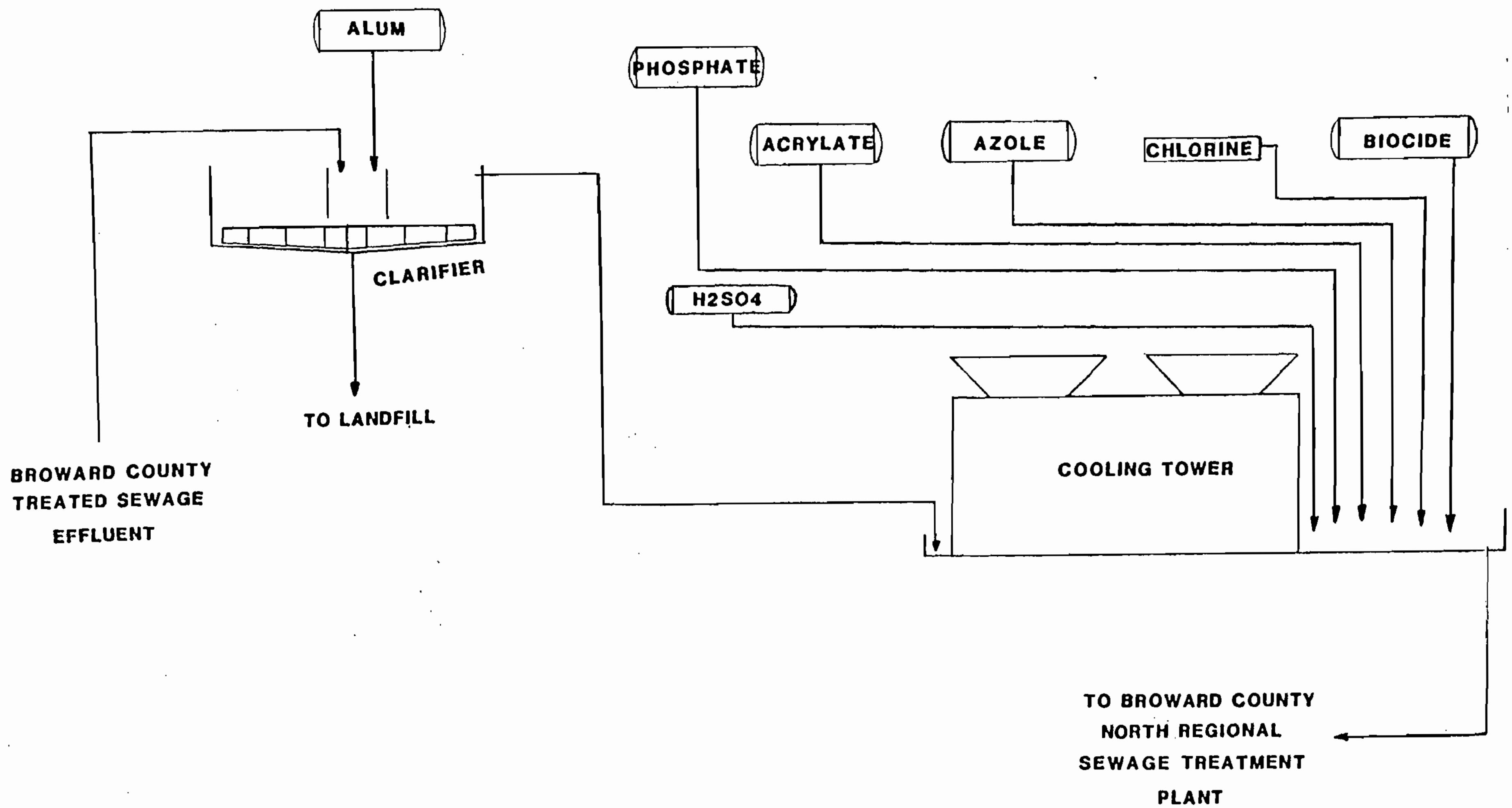
Figure 3.6.2 contains a flow diagram of the chemical waste associated with the cooling tower water makeup. Secondary treated sewage effluent from the Broward County Utilities Division will be mixed with alum and settled in a clarifier to reduce the water's phosphorus content. Sludge from the clarifier will be landfilled. The clarifier water will be then treated with sulfuric acid (pH control), polyphosphate (dispersant for iron), acrylate polymer (prevent $CaPO_4$, $MgPO_4$ and $ZnPO_4$ preciptiation) chlorine (microorganism control) and biocide agent (biocide control). An inhibitor may be used depending on final selection of the condenser metallury. Blowdown from the cooling tower will be discharged directly to the County sewer.

Since all chemical and biocide waste will be discharged to the Broward County North Regional Wastewater Treatment Plant for treatment, no local environmental impact will occur as a result of water plant operation.

3.7 Solid and Hazardous Waste

Anticipated solid waste generation from the facility will be in the form of ash residue. As indicated in previous sections, disposal of ash residue will be at a landfill located adjacent to the resource recovery plant.

Although these waste streams will be disposed of in the most efficient and environmentally secure manner, there still exists the possibility for recycling some of the waste products. For example, water used for the facility's operations will be cooled and recycled through the facility for other operational users such as ash quenching. Ash residue has been used on an intermittent basis in other cities and countries



BROWARD COUNTY

FLOW DIAGRAM OF THE CHEMICAL WASTE
ASSOCIATED WITH
THE COOLING TOWER WATER MAKEUP

FIGURE 3.6.2

as an aggregate base for road construction. Although consideration has been given to this type of reuse, additional research concerning its environmental impacts is required.

3.7.1 Solid Waste (Ash Residue)

Sources of Solid Waste

Solid waste in the form of ash residue is generated at three points in the proposed resource recovery facility. In each case, waste is conveyed from its point of generation to an ash quench tank for the purpose of cooling the ash, facilitating its handling, preventing fugitive dust emissions and serving as a seal to prevent air from leaking into the grate area through the ash discharge chute.

It is anticipated that ash will be generated at approximately 35 cubic yards per hour with four boilers operating at their initial installed capacity. The four points at which ash residue waste is generated and collected are as follows:

- Bottom-Ash - Burnout is achieved as waste is tumbled along the grates and kiln which comprise the stoker system. The residue passes through the kiln and falls off into the residue extractor trough below. A siftings hopper under the stoker system will catch siftings that fall through the grate bars. The siftings will then be gravity-discharged onto a vibrating conveyor which transfers the siftings to the ash quench tank.

- Boiler Fly Ash - A substantial amount of entrained particulate material (fly ash) carried by the combustion gas leaving the grate enclosure is removed in the boiler. The boiler is equipped with hoppers and valves for removing the accumulated fly ash while the boiler is in operation. Material collected in these hoppers is transferred by screw conveyors to the residue extractor trough.

- Electrostatic Precipitator Fly Ash - Fly ash remaining in the flue gas as it leaves the boilers is removed in electrostatic precipitators. This reduces its particulate concentration to the level required by environmental regulations. The fly ash is collected in hoppers at the bottom of the precipitator and is conveyed to the ash quench tank.

3.7.1.1 Handling System for Ash Residue

Ash from the combustion process falls from the rotary kiln into a quench trough from which it is removed by an drag chain conveyor. For reliability, the quench trough and conveyor system is fully duplicated. The makeup water required for the quench trough is supplied from boiler and cooling tower blowdown. The drag chain conveyor carries the ash up to an elevated transfer tower. The cooled ash then falls onto one of two redundant belt conveyors for transport to either a loading station for the landfill haul vehicles, or to stockpiles for night operations (Figure 3.2.1.6).

Fine particles which fall through the grates will be collected in hoppers below the grates and transported by enclosed vibrating conveyors to the quench trough, where it is mixed with ash from the rotary kiln. The fly ash collected in the boiler sections is conveyed by means of rotary valve and screw conveyors to this area also. The fly ash separated in the electrostatic preciptator is also transported via screw conveyors to the bottom ash collection area. The fly ash collected in the boilers and ESP's is combined with the bottom ash before leaving the plant area.

Following are the anticipated technical specifications for components of the ash handling system:

- o Quenching Tank/Basin/Trough

Number per Furnace/Boiler	2
Dimensions (LxW) ft.	200 x 8
Capacity (cu.ft.)	6,500

- o Conveyors

Bottom Ash: Type	Drag chain
Capacity (tons/hr)	25
Fly Ash: Type	Screw

MALCOLM PIRNIE

Capacity (tons/hr)	1.1
o Ash Bunker	
Dimensions (LxWxH) ft.	Two: 75 x 75 x 15
Capacity (tons)	1,500
o Overhead Cranes for Ash Handling	
Number	None
Capacity (tons)	N/A

3.7.1.2 Disposal of Ash Residue

Residue generated and collected at the resource recovery facility will be transferred by transfer truck to the residue/unprocessable waste landfill located adjacent to the facility.

The combined ash residue is required to meet the following criteria:

- o Putrescible content: 0.3% by dry weight.
- o Moisture content (excluding free liquid): 30% by weight.
- o Bulk density (lbs/cu.ft.) 70
- o Combustible content: 4.0% by dry weight.

3.7.2 Hazardous Waste

As previously mentioned, no hazardous materials will be accepted at the facility for disposal. Operators of delivery vehicles will be asked the source of the solid waste at the facility weigh station. Personnel will be present on the tipping floor and in the control room observing the dumping of garbage into the storage pit. Deliveries with a high probability for containing pathological wastes or hazardous wastes, because of the nature of the source or generator of the wastes, will be periodically inspected by facility personnel. Also, any suspicious trucks will be required to dump their loads on the tipping floor and the contents inspected.

The above method is used by mass burn facilities in the United States and has proved to be a very effective way of preventing pathological and hazardous wastes from entering the process stream.

Waste Management, Inc. has supplied the data presented in the table below. Predicted values are from combustion and heat transfer calculations for average conditions at nameplate capacity (550 tpd) of each furnace unit firing solid waste with a higher heating value of 4,500 btu/lb at 100% excess air.

WASTE MANAGEMENT, INC.
ESTIMATE OF FURNACE/BOILER CONDITIONS
NORTH BROWARD COUNTY RESOURCE RECOVERY FACILITY

Elevation Above Grate	Cumulative Residence Time (sec)	Temperature (°F)
Feed Grate #1	0.00	960
Feed Grate #2	0.76	2005
Feed Grate #3	1.24	2110
Rotary Kiln	1.88	2280
Gas By-Pass	1.92	1850
Afternburn Chamber	2.75	1800

The ash residue will be tested periodically to insure conformance with the Federal Resource Conservation and Recovery Act standards. Testing and characterization of ash residue produced by mass-burn resource recovery facilities in the United States has been limited to date but, research is continuing.

3.8 On-Site Drainage System

3.8.1 General

The Project site is a 25 acre facility located on the north side of the C-14 east drainage basin. On-site drainage will be controlled by a wet detention system in accordance with the guidelines of The South Florida Water Management District (SFWMD) "Management and Storage of Surface Waters Permit Information Volume IV". The design calculations are provided in Appendix 10.11.

We are seeking a certification condition that detailed design drawings relocating the drainage ditch and indicating the flow drainage be provided to SFWMD for review and approval prior to facility construction.

3.8.2 Water Quality Design Criteria

SFWMD water quality guidelines for wet detention areas requires a volume for the greater of the first inch of runoff from the developed project or the total runoff from a 3 year, 1 hour rainfall. This required volume will be stored in a 1.4 acre wet detention basin. Discharge of the 3 year 1 hour rainfall runoff will be through a bleed-down V-notch in a weir that will be sized to discharge no more than one-half of the detention volume in 24 hours.

3.8.3 Peak Discharge Criteria

Detention for the 25 year storm will be provided by the 1.4 acre detention basin plus storage provided by the 3 acre drainage swale and catch basin system. The peak discharge from the 25 year 72 hour design storm will be regulated by a weir to limit discharged to the maximum value allowed for the C-14 canal drainage basin.

3.8.4 Seasonal Water Table Elevations/Control Elevation

Water levels in the C-14 canal at pump station S37B are at a maximum elevation of 8.0 NGVD for the dry season and 7.0 NGVD for the wet season. Groundwater levels in the area fluctuate during the various seasons with maximum ground water occurring during the fall months. Design high ground water table for the resource recovery site will be 9.0 NGVD and is based upon the ground water values used for the permitted adjacent landfill facility.

3.8.5 Resource Recovery Facility Drainage Control

All rainwater runoff for the facility will be collected by a drainage swale and catch basin system that transports all water to the on-site wet detention basin. Disposal of detained water will be accomplished through a weir system that discharges into a canal adjacent to the site. Release will be gravity controlled with the rate of discharge in accordance with SFWMD criteria. The detention basin will be a 1.4 acre facility located along the north side of the plant. The outfall structure for the site will be located on the east side of the detention basin and will be a reinforced concrete broad crested weirs. The 3 year design storm is detained for water quality purposes with a weir crest elevation of 10.2 NGVD. During the 25 year-72 hour storm the water level in the pond will rise to elevation 13.0 NGVD and will be discharging through the 10 inch wide weir at a maximum rate of 15.5 cfs. Discharge from the weir to the canal will be conveyed via 24 inch diameter reinforced concrete pipe. The water level in the pond will be returned to the control elevation of 9.0 NGVD with a V-notch bleeder slot in the weir. The berms for the pond will be constructed to an elevation of 13.5 NGVD to provide a 0.5 foot freeboard for the maximum water elevation. The basin side slopes will be 4 horizontal to 1 vertical and will be grassed to prevent erosion. All building floor elevations shall be set at a minimum elevation of 14.0 NGVD to provide protection for the 100 year flood. This elevation was based upon design charts supplied by SFWMD.

3.9 Materials Handling

3.9.1 Facility

No heavy equipment such as large cranes, plant components such as boilers, or other voluminous materials will be transported to the site, unloaded, stored, or moved around the site during normal operation or maintenance of the facility. Most equipment will be positioned inside the facility's buildings, and most maintenance will be carried out within the building except for routine painting, electrical work, and minor maintenance. The area where the steam turbogenerator is housed will have an overhead crane for maintenance of the turbogener-

TABLE 3.9.2.1

EQUIPMENT LIST

<u>Ash Handling</u>

1 Caterpillar 980 F.E.L.

1 Caterpillar 966 F.E.L.

3 Dump Trucks

1 Street Sweeper

ator. The solid waste and residue will be hauled in trucks. Section 5.9 describes and analyzes the impact of the truck traffic.

SECTION 4

ENVIRONMENTAL EFFECTS OF SITE PREPARATION AND PLANT AND ASSOCIATED FACILITIES CONSTRUCTION

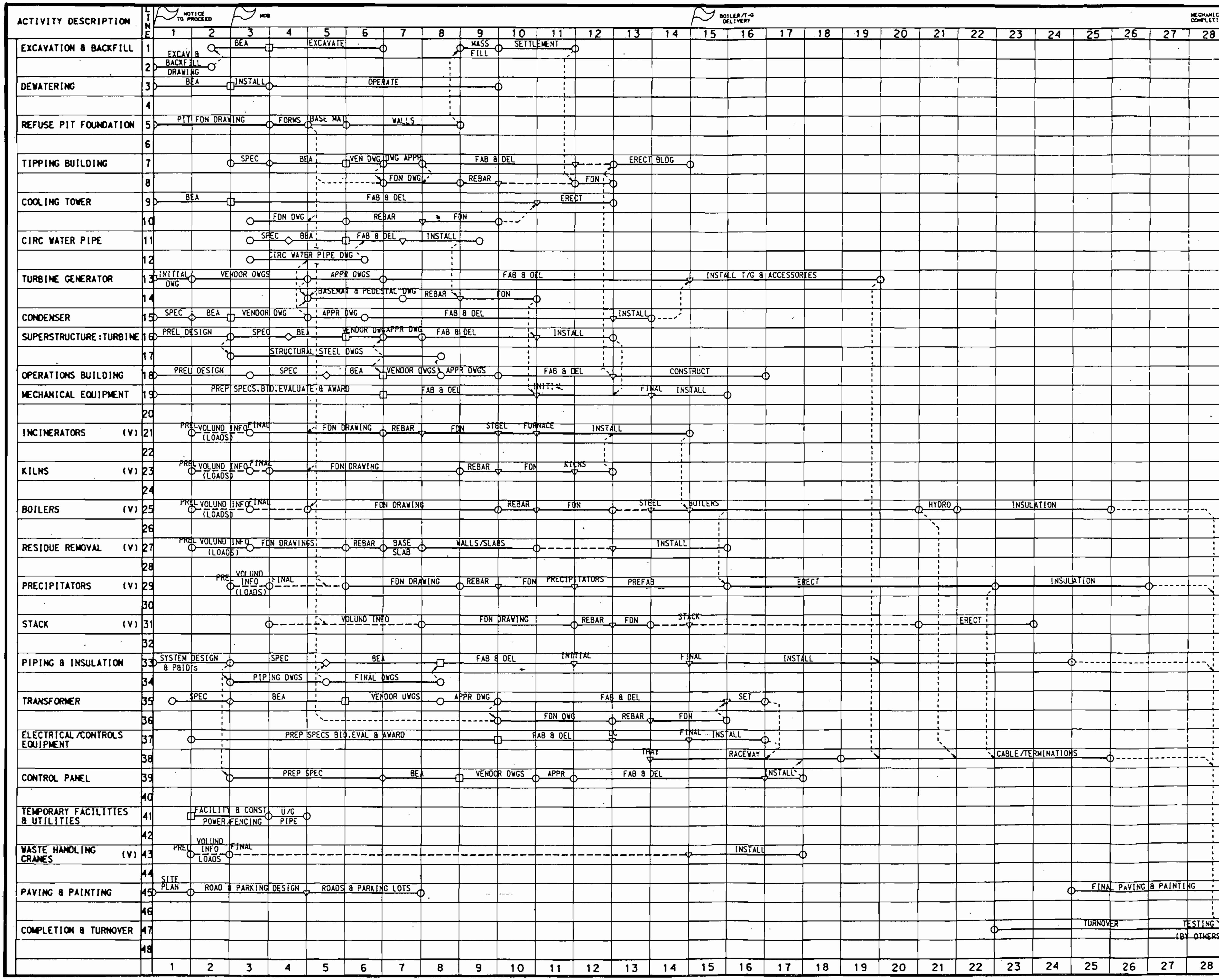
Introduction to Construction Phases and Activities

It is anticipated that the construction period for the Northern Broward County Resource Recovery Facility will be approximately 28 months. Initially, there will be a seven-month period for preparation of final process, civil, and structural design and the design and purchase of major equipment. This would be followed by an intensive 16 month construction phase. After construction, there will be approximately five months of personnel training, equipment testing, plant start-up shakedown.

The principal construction phases for the resource recovery facility will include site preparation (site clearing and preparation, grading, excavation, pile driving and backfilling), facility construction (foundations, building and process equipment erection, electrical and mechanical systems installation, instrumentation), and finalization (road construction and paving, equipment start-up and testing, final grading, landscaping and cleanup). Possibly the completion of the final construction activities will extend into the shakedown period.

Figure 4.1 is a graphic representation of the expected progression of field construction activities. This figure indicates the activities that will be involved in the construction of the resource recovery facility and the estimated time required for completion of each activity. The environmental effects of the construction activities are presented in the following sections.

FIGURE 4.1



LEGEND

- START/END ACTIVITY
- EQUIPMENT DELIVERY
- AWARD
- ISSUE FOR BIDS
- MILESTONE
- RESTRAINT TO
- RESTRAINT FROM
- CRITICAL PATH

ABBREVIATIONS

APPR	- APPROVE
BEA	- BID, EVALUATE & AWARD
DEL	- DELIVERY
DWG	- DRAWING
FAB	- FABRICATION
FDN	- FOUNDATION
MOB	- MOBILIZATION
REBAR	- REBAR FABRICATION & DELIVERY
T/C	- TURBINE GENERATOR
(V)	- VOLUND SUPPLY
VEN	- VENDOR

BROWARD COUNTY

RESOURCE RECOVERY PROJECT ESTIMATED FIELD/CONSTRUCTION SCHEDULE

4.1 Land Impact

4.1.1 General Construction Impacts

4.1.1.1 Land Disturbance

The amount of land which will be disrupted by construction is approximately 25 acres. The existing terrain will be disturbed by the following activities.

1. Initial Site Preparation and Clearing

   The site will be cleared, grubbed, and graded to provide proper drainage. Topsoil will be stripped from all areas to be cut and filled and stockpiled in designated areas of the site. Borrow will be obtained from off-site as necessary. The drainage ditch will be relocated to the eastern side of the site.

2. On-Site Excavation and Filling

   Excavation will be required for the retention pond, the area for the switchyard, building areas, refuse bunker, cooling tower and all roads up to the limit of the backfill. Excavated soil that is unsuitable for fill material will be stockpiled for use as landfill cover or wasted in designated areas on the site. The stockpile and waste areas will be graded to drain properly. The fill area will be constructed of approved earth or friable materials free of organic substances, spongy soil, or other objectionable material that would prevent satisfactory compaction. All fill will be compacted in accordance with applicable specifications.

3. Fill Placement for Tipping Floor

   Coincident with the excavation activities will be the placement of backfill required for the elevation of the tipping floor and its associated access ramps.

The site is comprised of basically a flat terrain and therefore, minimal erosion during construction is anticipated. The erosion that will occur can be controlled by various methods. They include the use of netting, sodding or mulch seeding, as well as leaving exposed areas bare for as little time as possible during construction.

4.1.1.2 Staging, Material, Lay-Down, and Work Force Parking Areas

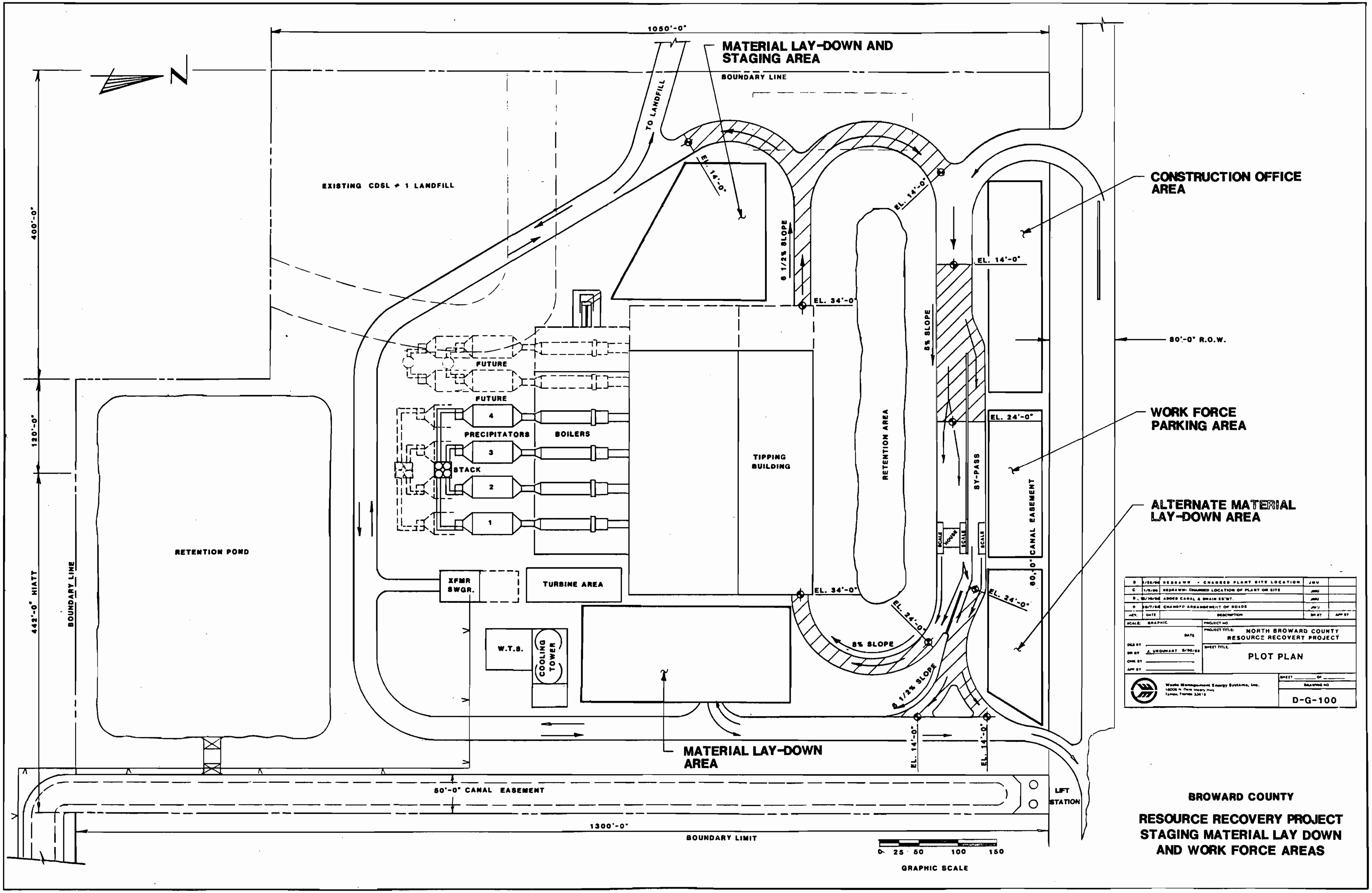
The staging, materials lay-down, storage, and parking areas must be directed to areas where there are minimal construction activities. Areas west and east of the resource recovery facility will be utilized as materials lay-down areas due to their closeness to the facility and site entrance. These locations will minimize the level of traffic near the center of construction and reduce the handling distances for construction materials. A construction office and general work force parking area will be located adjacent to the site entrance. Locating the parking area near the site entrance will minimize traffic interference. Figure 4.1.1.2.1 indicates the construction support areas in relation to the construction areas.

4.1.1.3 Impact on Solid Waste Generation and Disposal

A variety of solid waste materials will be generated periodically throughout each of the construction phases of the resource recovery facility. These wastes will include vegetation, trees, concrete, metal, paper, trash and oils and fluids required for equipment operations. They will be disposed of off-site.

The initial clearing of the facility will produce vegetative matter and wood and concrete debris. These types of wastes will be generated by the removal of vegetative ground cover, trees and demolition of a structure located on the north central portion of the site. All the debris will be hauled to the adjacent landfill for disposal.

As a result of equipment maintenance and various construction activities, waste oils and solvents will be generated on-site. The rate of generation for waste oil will be approximately two to three drums (55 gallon barrel) every three months. Waste solvent on the other hand will be generated mostly during certain phases of equipment installation, e.g.,



1050'-0"
MATERIAL LAY-DOWN AND STAGING AREA
BOUNDARY LINE
TO LANDFILL
EXISTING CDSL # 1 LANDFILL
400'-0"
120'-0"
442'-0" HIATT
BOUNDARY LINE
RETENTION POND
EL. 14'-0"
EL. 34'-0"
6 1/2% SLOPE
8% SLOPE
RETENTION AREA
BY-PASS
CANAL EASEMENT
60'-0"
EL. 24'-0"
80'-0" R.O.W.
CONSTRUCTION OFFICE AREA
WORK FORCE PARKING AREA
ALTERNATE MATERIAL LAY-DOWN AREA
FUTURE
PRECIPITATORS
BOILERS
STACK
TIPPING BUILDING
XFMR SWGR.
TURBINE AREA
W.T.S.
COOLING TOWER
SCALE
SCALE HOUSE
MATERIAL LAY-DOWN AREA
50'-0" CANAL EASEMENT
LIFT STATION
1300'-0"
BOUNDARY LIMIT
0 25 50 100 150
GRAPHIC SCALE
NORTH BROWARD COUNTY RESOURCE RECOVERY PROJECT
PLOT PLAN
Waste Management Energy Systems, Inc.
D-G-100
BROWARD COUNTY
RESOURCE RECOVERY PROJECT
STAGING MATERIAL LAY DOWN AND WORK FORCE AREAS

piping and electrical systems where solvent generation could be two to three times that of oil. The waste oil and solvents will be stored in 55 gallon drums, contained in a bermed area, covered with a weather-proof canvas and properly labeled. Properly licensed contractors will transport and dispose of these wastes every two to three months as required under the Resource Conservation and Recovery Act manifest system.

A total of approximately 250 tons of solid wastes will be generated over the duration of construction. The pattern of waste generation follows the type and level of activities occurring on-site (Figure 4.1.1.3.1). During site preparation and clearing there will be an initial peak, which will then be followed by a waste generation drop and then by an increase which coincides with the actual construction and installation activities.

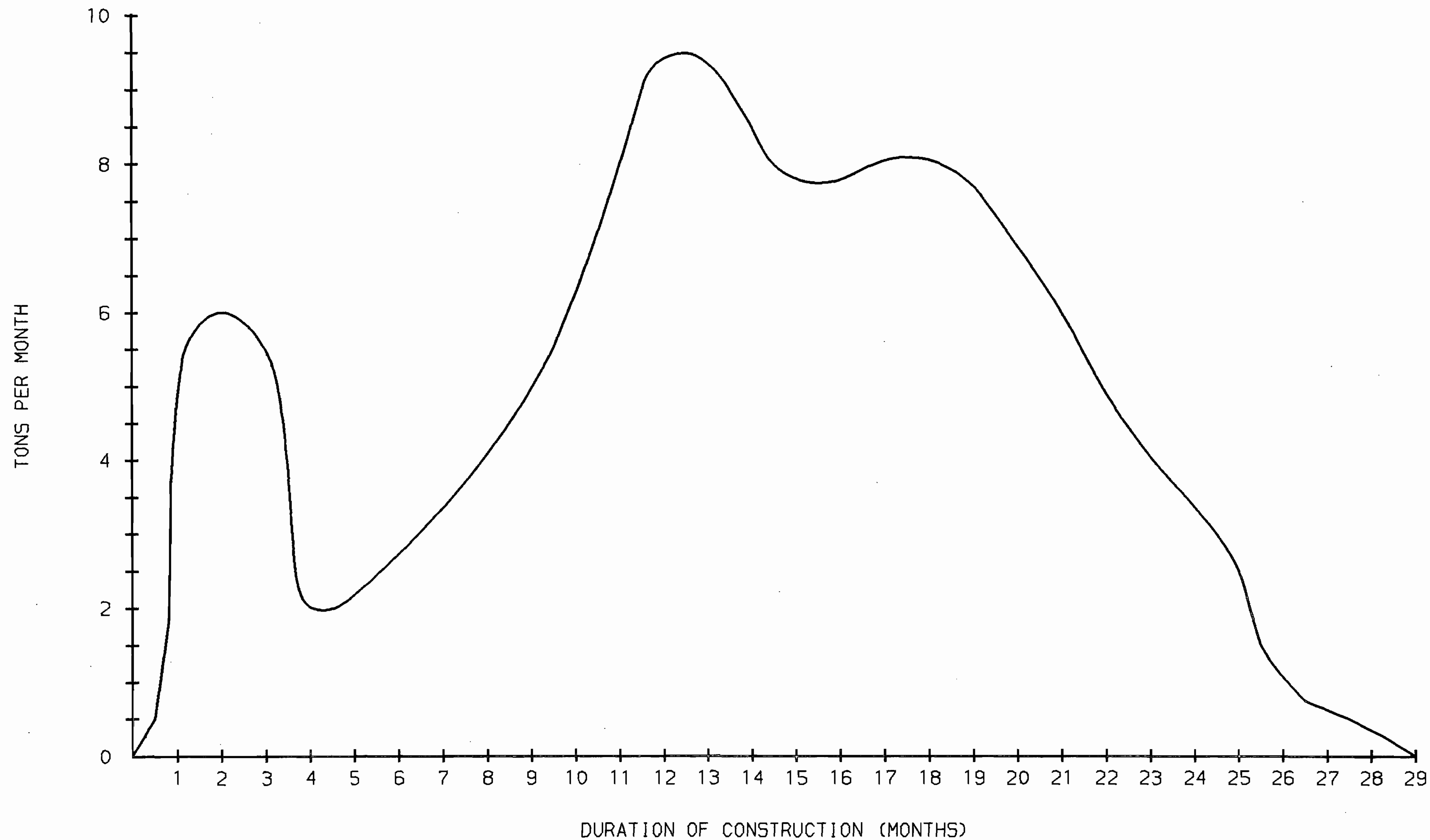
4.1.2 Roads

On-site access roads will be the only roads constructed for this Project. These access roads will be paved. Soil holding vegetation will be indigenous grasses.

Roadways will be designed at a minimum to provide a 12 foot asphalt pavement width per lane with a 4.0 foot shoulder on each side. Roadways will meet Florida Department of Transportation Manual Standards. The shoulders will be sodded and the sideslopes constructed at a maximum slope of 3 horizontal to 1 vertical. Roadway sideslopes and swales will be covered with 6 inches of topsoil and seeded immediately to reduce surface erosion.

Access roadways to the remaining portions of the areas to be landfilled, around the retention ponds, etc., provide for one-way traffic movement on a single lane 12 foot paved asphalt surface with 4.0 foot shoulders.

During construction, on-site access roads will be adequately wetted to minimize wind erosion and dust generation as needed. Chemical binders will be used only as required. The specific binders have not yet been identified.



BROWARD COUNTY

RESOURCE RECOVERY PROJECT

ESTIMATED SOLID WASTE GENERATED DURING CONSTRUCTION

4.1.3 Flood Zones

Proposed structures are to be placed above the 100-year flood plain; therefore, the Project will be constructed in compliance with local flood program regulations. The 100-year flood plain map, with site location, is presented in Figure 2.1.4.1.

4.1.4 Topography and Soils

The construction of a retention pond will alter the topography of the site. The retention pond will cover approximately 1.25 acres and will be dredged down to 4-7 feet.

Roads and buildings will cover more and more of the site as construction progresses. Approximately 339,925 square feet of impervious surfaces will cover the site by the end of construction. Buildings will cover approximately 197,250 square feet and roads and parking lots will cover approximately 192,675 square feet.

Due to these impervious surfaces the drainage features and percolation rates of the site will change, but the total runoff volume will not be substantially affected by the increase.

The subsurface conditions will be affected by the construction of the refuse bunker. The dimensions of the bunker will be 255 feet long, 100 feet wide and 28 feet deep. When the bunker is constructed, it will have to be excavated down to about thirty-three feet. Sheet piling will be used to shore up excavated areas, and load bearing piling will be installed underneath the areas of the main structure having the heaviest loads.

During construction berms will be constructed to contain water during filling. Sediment traps and screens will be strategically placed to trap runoff. All permanent berms constructed for the development will be grassed to prevent erosion. No discharge of sediment laden water will be made during construction.

The changes in the site's drainage features or the planned construction activities will not result in the formation of any sink holes or result in any subsidence. Settlement will occur due to the increased load on soils by the planned backfilling, but it should be minor.

The use of piles to support heavy equipment will improve the bearing capacity of the site. The site's subsurface conditions should have no long-term problems due to the construction.

Aesthetically the construction activities will have some temporary negative impacts on nearby residences, but the visual impacts should be limited due to the distance to the closest residential area. Backfilling activities to bring existing grade up to + 34 feet MSL for the planned tipping floor will result in activities occurring above existing ground levels. A minor visual impact will result from the backfilling operation and resulting mounds.

4.2 Impact on Surface Bodies and Uses

4.2.1 Impact Assessment

No impact upon surface waters will result due to site preparation and construction activities nor shall any use of water bodies be made during plant construction.

4.2.2 Measuring and Monitoring Programs

Since no water bodies will be impacted by the construction or operation of the plant, no measuring and monitoring program will be required.

4.3 Groundwater Impacts

4.3.1 Impact Assessment

The chemical quality and physical condition of the local groundwaters will not be significantly affected by site preparation or construction. The construction of the facility will have no significant impact on groundwater levels either on or off site.

Site dewatering may be necessary prior to construction of the refuse pit. If dewatering is necessary excavated material will be used to build a holding pond on the site for the water extracted in the dewatering process. The water will be allowed to percolate back into the ground. Detailed construction plans for this Project have not yet been completed so the amount of dewatering, if any, which will be required has not yet been established.

4.3.2 Measuring and Monitoring Program

Since the chemical quality or physical condition of the local groundwater will not be significantly affected by site preparation or construction, no measuring and monitoring programs will be required. Both groundwater and surface water monitoring is already done on an extensive basis in the area of the site because of its proximity to the Central Disposal Landfill.

4.4 Ecological Impacts

4.4.1 Impact Assessment

Almost the entire site will be modified from its existing state. This will be the result of actual facility construction, site grading for drainage, preparation of a retention basin, and final site landscaping. The ecological features of the site will be modified as a result of construction, but the site has been previously cleared, scraped, and bulldozed. Any fauna displaced by construction can move to adequate habitat adjacent to the site without serious detriment. The construction activities will have a very minor overall effect on both on and off-site local ecosystems.

4.4.2 Measuring and Monitoring Programs

No monitoring programs are required based upon the data presented in Section 2.3.6 and conclusions presented in Section 4.4.1.

4.5 Air Impact

4.5.1 Fugitive Dust and Mobile Source Emissions

Short-term and local air quality impacts are caused by land clearing, site preparation and emissions from construction equipment. These air quality impacts will vary during each phase of construction, with the greatest impact for fugitive dust occurring during the site preparation phase when approximately 20 acres (Table 4.5.1.1) of the facility will be exposed, and the greatest emission impacts from mobile sources occurring during the construction phase (Table 4.5.1.2) when the amount of equipment on-site is the greatest.

4.5.2 Mitigation Measures

For the impacts described in the preceding section a number of mitigation measures are available to minimize the impacts. If the following practices are carried out, particulate emissions can be reduced significantly.

- o Particulate matter from unpaved roads:
  - Routine watering of the roadway would provide at least a 50% reduction in emissions
  - Penetrating chemicals sprayed on the surface can also provide a 50 percent reduction in emissions. However, chemical spraying would cost more than watering.
  - Paving the roads would provide up to an 85 percent reduction in emissions. This can be done by either soil compaction and adding base coarse material or by soil stabilization with an asphalt cap.

TABLE 4.5.1.1

CONSTRUCTION ACTIVITIES IMPACTING FUGITIVE DUST

Construction Phase	Anticipated Areas to be Exposed Simultaneously	Estimated Area of Land Cleared (Acres)
SITE PREPARATION	Relocation of Drainage Ditch	1
	Retention Pond	7.5
	Access Roadway Stripped to Subgrade	7.2
	Backfill Embankment	7.1
	Miscellaneous (Staging Area, Employee Parking, Materials, Lay Down Area, etc.)	4.3
FACILITY CONSTRUCTION	Access Roadway Stripped to Subgrade	7.2
	Backfill Embankment	7.1
	Miscellaneous (Staging Area, Employee Parking, Materials, Lay Down Area, etc.)	4.3
FINALIZATION	Estimated Area to be Exposed at One Time Due to Landscaping and Final Grading	11.0
	Miscellaneous (Staging Area, Employee Parking, etc.)	4.3

TABLE 4.5.1.2
CONSTRUCTION ACTIVITIES IMPACTING NOISE AND EMISSIONS FROM CONSTRUCTION EQUIPMENT

Construction Phase	Activities Occurring Simultaneously	Anticipated Operating On Site	Relative Location of Equipment On Site
SITE PREPARATION	Relocation of Drainage Ditch	1 Backhoe 1 Dozer 1 Grader 2 Trucks	Localized
	Sheet Pile Driving for Refuse Bunker	1 Pile Driver 1 Front End Loader	
	Refuse Bunker Excavation	2 Backhoes 7 Trucks	Localized
	Placement & Compaction of Fill for Tipping Floor	2 Dozers 3 Trucks	Spaced 500 Ft. Along Access Road
FACILITY CONSTRUCTION	Concrete Placement	1 Pump 2 Saws 3 Vibrators	Localized
		3 Trucks	Spaced 500 Ft. Along Access Road
	Structural Steel Erection	2 Cranes 2 Dericks 4 Pneumatic Tools 2 Welders 1 Compressor	Localized Within A 200' Radius
	Major Equipment Installation	2 Cranes 1 Fork Lift 2 Generators 8 Pneumatic Tools 2 Compressors 3 Welders	
FINALIZATION	Scale Installation	1 Crane 2 Pneumatic Tools 1 Compressor 1 Welder & 1 Generator	Localized
	Paving of Access Road	1 Paver 2 Trucks	Mobile Along Paved Roadway
	Landscaping and Final	1 Dozer 1 Grader	Transit Over Entire Site

- Particulate emissions across open and active construction areas:
  - Watering of the site would reduce emissions by 50 percent.
- Particulate emissions from completed cut and fill areas:
  - Planting vegetation as soon as possible can reduce emissions between 65 and 85 percent.
  - Applying chemical binders also can reduce emissions between 65 and 85 percent.

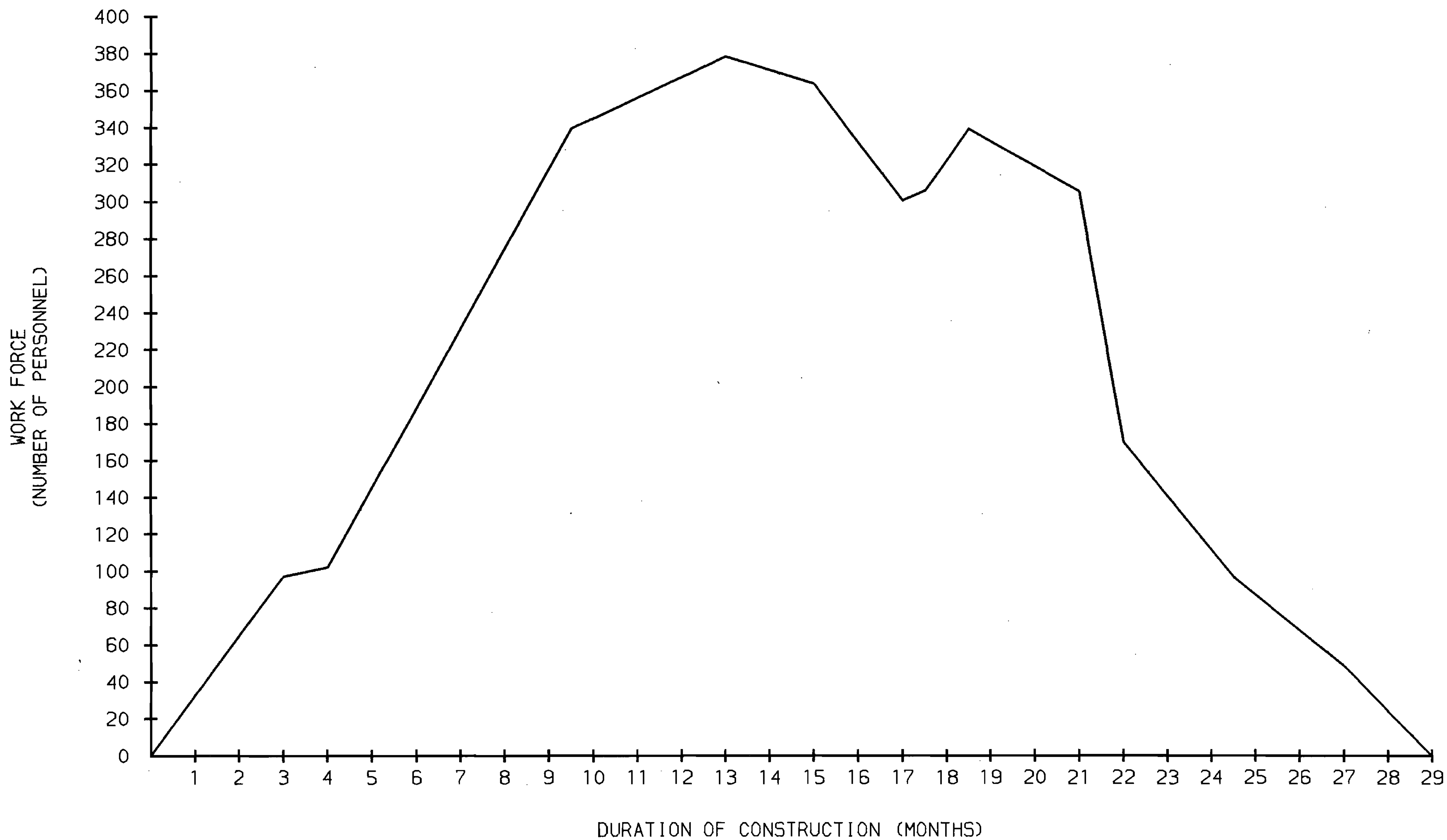
4.6 Impact on Human Populations

4.6.1 Sensitive Receptors

In Section 2.2, Socio-Political Environment, land use and demographic features were discussed in detail. The area around the site is used mostly for industry and recreation. These land uses are not considered sensitive receptors for this report. The nearest sensitive receptor is the residential area east of Powerline Road.. This area would be impacted temporarily most by traffic, noise and fugitive dust during the construction of the facility. There are no hospitals; churches or schools in the vicinity of the site.

4.6.2 Work Force

The estimated total peak construction work force will be approximately 380 personnel. The initial phase of construction (site clearing, access roads and excavation of retention pond) will require a work force of approximately 100 personnel for the first 6 months. From the ninth month to the twenty-second month the work force should increase to about 500 and average from 340 to 380 personnel. The estimated work force requirements are presented in Figure 4.6.2.1. The work will mainly take place on an eight hour per day shift, five days a week but some night time and weekend work can be expected.



BROWARD COUNTY

RESOURCE RECOVERY PROJECT

ESTIMATED WORK FORCE REQUIREMENTS DURING CONSTRUCTION

The County's local economy and labor market will benefit from the project. Proposals submitted by potential vendors include provisions for hiring local construction labor and contractors. Preliminary commitments with the local labor force have been established through a National Industrial Construction Agreement. No major relocation of construction workers and families is anticipated. Therefore, no impact on available housing, schools or other community support assets is expected.

It is anticipated that local construction and equipment suppliers will realize both direct and indirect benefits from both the construction and operation of the resource recovery facility.

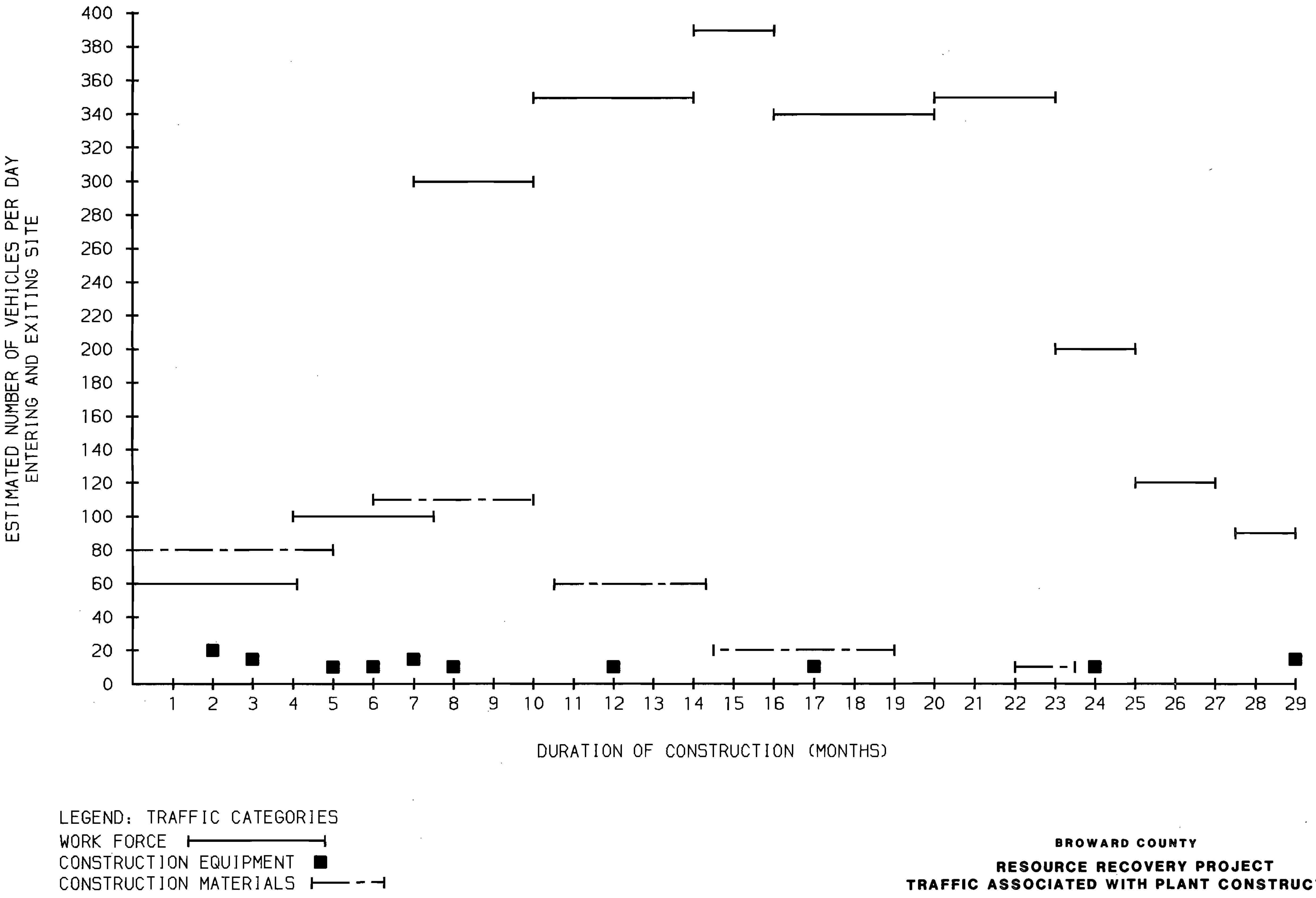
4.6.3 <u>Traffic Associated with Construction</u>

Traffic due to construction will enter and exit the site by way of Hilton Road (N.W. 48th Street). This traffic will consist of the daily work force, delivery of construction equipment and delivery of construction materials (Figure 4.6.3.1).

The general work force traffic will average about 80 vehicles per day for the first eight months, and then average about 350 vehicles per day for the next sixteen months. After the twenty-fourth month, the general work force traffic will fall off as construction is completed. The greatest impact of this traffic will occur at the start of the work day at 7:00 A.M. and at the end of the work day at 4:00 P.M.

The traffic caused by the delivery and removal of construction equipment will be spread out over the duration of construction. Most of the equipment will be delivered at the start of site preparation, but other pieces will be delivered as needed. The impacts of this traffic will be of short duration of a few hours at a time.

The traffic caused by the delivery of construction material will average about 100 vehicles per day for the first



BROWARD COUNTY

RESOURCE RECOVERY PROJECT

TRAFFIC ASSOCIATED WITH PLANT CONSTRUCTION

ten months and then drop off to about sixty vehicles per day for the next nine months. The impacts of this traffic will be spread over the work day.

The maximum traffic during construction for all three categories will be approximately 400 vehicles per day. This will reduce the available capacity of N.W. 48th Street (Hilton Road) early morning and late afternoon but will not result in any unacceptable roadway capacity problems. A more detailed analysis on traffic is presented in Section 5.9.

4.6.4 Noise

Noise emissions from the proposed faciity will not significantly impact the surrounding community and will meet standards of working condition comfort for on-site personnel. During the design phase, noise abatement features will be incorporated into the design. During the construction phase, temporary intrusive noise emissions will be controlled by the use of noise-attenuating devices (e.g. mufflers) or equipment, barriers and by ensuring compliance with vehicle noise regulations. Major noise-producing construction activities will be confined to normal working hours.

4.7 Impact on Landmarks and Sensitive Areas

The Project will not have an impact on landmarks or sensitive areas.

4.8 Impact on Archaeological and Historic Sites

As stated in Section 2.2.6, The State of Florida, Division of Archives, History and Records Management stated that there are no known or potential historic or archaeological resources at the site. Therefore, there will be no construction impacts on archaeological or historic sites.

4.9 Special Features

This section describes and discusses all special features associated with site preparation and plant and associated facilities construction that may have an influence on the environment and ecological systems of the plant site and adjacent areas.

During construction there will be generated certain quantities of solid and liquid waste. This waste may take the form of earth spoils, discarded packaging materials, refuse produced by construction workers, sanitary wastes, or waste oils. To maintain the aesthetic and ecological integrity of the site and surrounding areas proper handling and disposal of these wastes on-site will occur.

4.10 Benefits From Construction

Section 7, Economic and Social Effects of Plant Construction and Operation provides an analysis of social and economic benefits arising from plant construction. Specifically, these benefits include:

- o Adequate Disposal
- o Economic Viability
- o Environmental Security
- o Energy Production
- o Local Economy Stimulers, and
- o Social Enhancement.

4.11 Variances

No variances from standards or guidelines are anticipated for this Project.

diameter water line adjacent to Powerline Road. Discharges from the resource recovery facility will flow to an existing 36-inch sanitary sewer line located directly adjacent Powerline Road. As such, no water body will be directly affected by the resource recovery facility cooling water demand or discharge.

5.1.4 Effects of Offstream Cooling

This section, as described, is not applicable to the Project since the water cooled system proposed will not have a measurable impact on the local environment.

5.1.5 Measurement Program

Programs and methods for measuring the physical and chemical parameters of waters which will be affected during operation of the facility are not applicable to the Project because no water body will be directly affected by the operation of the facility.

5.2 Effects of Chemical and Biocide Discharges

5.2.1 Industrial Wastewater Discharge

There will be no off-site industrial discharges to surface waters or to groundwater from the operation of the resource recovery facility. All discharges will go to the Broward County North Regional Wastewater Treatment Plant. This method of ultimate disposal will meet all applicable state and federal discharge regulations and water quality standards for industrial wastewater including chemical and biocide wastes, and oil and grease.

5.2.2 Cooling Tower Blowdown

Chemicals for treating the cooling water will be selected so that the blowdown can be sent to the Broward County North Regional Wastewater Treatment Plant. The County plant's secondary treated effluent will be the source of cooling water

SECTION 5

EFFECTS OF PLANT OPERATION

5.1 Effects of the Operation of the Heat Dissipation System

The design of the heat dissipation system, as discussed in Section 3.5, is based upon the utilization of a water cooled condenser. Condensate from the turbine-generator will be collected, processed and returned to the deaerator. A dump condenser will be installed so that the facility can bypass the turbine (when out of service for maintenance) and condense the total output of all boilers under maximum steam generation. The condensing system will incorporate a flexible design to enhance operation and maintenance reliability. In addition, the systems will be designed to avoid sustained periods of steam release (from pressure relief valves) and thus mitigate any potential negative effects from its operation. As such, effects from limited steam venting, considered unavoidable, will only be temporary and later ameliorated.

Refer to Section 3.5.1 for a detailed description of the cooling tower system which removes the heat from the condenser and exhausts it to the air via evaporation.

5.1.1 Temperature Effect on Receiving Body of Water

This section is not applicable to the project since no heated effluent will be discharged from the resource recovery facility into any body of water. All discharges will be to the County sewer system.

5.1.2 Effects on Aquatic Life

This section is not applicable to the project since there will be no process effluent discharged from the resource recovery facility into any body of water.

5.1.3 Biological Effects of Modified Circulation

The resource recovery facility will use wastewater plant effluent supplied by Broward County Utilities Division. Supply will be made available to the facility via an 8-inch makeup, therefore if the resource recovery plant is unable to accept the secondary treated effluent, it will simply be ocean outfall discharged as it presently is being done.

5.2.3 Measurement Programs

No measurement programs for water bodies or groundwater will be required since the cooling tower blowdown will be discharged directly to the County sewer system.

5.3 Impacts on Water Supplies

Due to the sensitive nature of the hydrologic environment of this portion of Broward County, the conceptual design for construction and operation of the resource recovery facility has been developed in order to have a minimal impact, both quantitative and qualitative, on groundwater and surface water supplies.

The major source of potential impact on water supplies from the facility is from on-site surface water runoff. Section 3.8, On-Site Drainage System, describes how uncontaminated stormwater runoff will be collected, retained and treated in order to conform with state and local regulations.

5.3.1 Surface Water

No changes in hydrologic or water quality conditions due to diversion, interception, or additions to surface waters will result because the plant will not withdraw from, consume, or discharge to any surface water bodies. All water supplies will be obtained from the Broward County Utilities Division as well as receiving all plant water discharges.

5.3.2 Groundwater

No impact will result upon groundwater or water table elevations from this facility because no withdrawal or discharges to groundwater will result. All water supplies will be obtained from the Broward County Utilities Division as well as receiving all plant water discharge.

5.3.3 Drinking Water

Drinking water for the facility has been included in the sanitary water requirements (5 gpm), which will be supplied by the Broward County Utilities Division's potable water system. An analysis of the county's potable water is presented in Table 5.3.3.1. Sanitary wastewater discharge will go directly to the County's sewer system.

5.3.4 Leachate and Runoff

Residue from combustion of refuse will be stored in an enclosed bunker. The floor of the bunkers together with the surrounding surface area will be sloped and contoured to retain any runoff or leachate from the residue pile, and redirect it to the ash quench troughs within the plant.

This project does not include landfill construction or operation. No wastewater ponds will be constructed or operated. No flue gas desulphurization will be required.

All runoff within areas of potential leaching of toxic extracts from solid wastes will be retained within the immediate area of the source and will not affect the remaining runoff on the site. Therefore, seepage plumes predictions will not be applicable.

5.3.5 Measurement Programs

No measurement programs for water bodies or groundwater will be required since all runoff leaving the site will be essentially free of any potentially leachated toxic extracts. An extensive ground and surface water monitoring program already exists in the area because of the close proximity to the Central Disposal Landfill.

5.4 Solid/Hazardous Waste Disposal Impacts

The impact of solid and hazardous waste disposal related to the project is expected to be minimal.

5.4.1 Solid Waste

As previously discussed in Section 3.7, Solid and Hazardous Waste, solid waste in the form of residue from the re-

TABLE 5.3.3.1

BROWARD COUNTY UTILITIES DIVISION
TYPICAL POTABLE WATER ANALYSIS

pH	9.1	
Total Combined Cl_2	2	mg/l
Total Hardness	63	mg/l as $CaCO_3$
Alkalinity	24	mg/l
Ca Hardness	39	mg/l
Calcium	22.5	mg/l
Magnesium	1.6	mg/l
Bicarbonate	20.9	mg/l as $CaCO_3$
Carbonate	2.5	mg/l
Hydroxide	0.6	mg/l
Sodium	11	mg/l
Chloride	22	mg/l
Color	8 - 10	Color Units
Foaming Agents	0.14	mg/l
Sulfate	27	mg/l
TDS	115	mg/l
Nitrate	0.04	mg/l as N
Floride	0.9	mg/l
Turbidity	0.3	NTU
Iron	<0.01	mg/l
Manganese	<0.01	mg/l
Arsenic	<0.001	mg/l
Cadmium	<0.001	mg/l
Barium	<0.001	mg/l
Zinc	<0.02	mg/l

source recovery facility will be handled in a safe, controlled manner from the point of generation to the point of disposal at an existing adjacent landfill owned by Waste Management, Inc.

5.4.2 Hazardous Waste

As described in Section 3.7.2, Hazardous Waste, it is expected that little, if any hazardous waste will enter or accepted at the facility. Any waste which is deemed to be hazardous will be stored, transported and disposed of off-site in accordance with all applicable hazardous waste regulations.

5.5 Sanitary and Other Waste Discharges

All sanitary and other waste discharges (i.e., boiler blowdown and process water waste) will be disposed of at the BCNRWTP. Therefore, there will be no expected effects of these discharges on off-site water supplies. No pretreatment of process or sanitary wastewaters is anticipated before ultimate disposal at the BCNRWTP and, therefore, no sewage or industrial sludge will be generated. If pretreatment becomes necessary in the future, sludges will be disposed of off-site at approved facilities.

Facility process wastewater treatment consists of neutralization of demineralizer regenerant waste and collection of all waters, except sanitary, for maximum reuse within the plant. Specific features include:

- o Wastewater Storage Basin - Floor drains, sample coolers, boiler blowdown, and neutralization tank streams are collected in this sump. Water is pumped for use in the ash collection system. Any excess waters are discharged to the sewer.

- o Neutralization Tank - Regenerant chemicals from the demineralizer are collected in this tank. After pH adjustment, water from this tank flows to the quench water storage basin for reuse.

- o Weir Box - A weir box will be provided to measure process water flow to the city sewer. Sanitary waste and any excess process water will be discharged to the city sewer.

As evidenced by the above data, it is not believed that the pretreatment of sanitary, porcess or leachate wastewaters will be necessary before ultimate disposal at the BCNPWWTP. However, in order to ensure that wastewater quality standards are met for this particular facility, periodic water quality testing will be performed during facility start-up and operations. If in the event treatment plant wastewater quality standards are not met, it will become necessary to incorporate some type of pretreatment before disposal to the sanitary system.

5.6 AIR QUALITY IMPACTS

Predicted maximum impact concentrations for the proposed North Broward County Resource Recovery (NBCRR) facility at projected maximum operation, using screening and refined modeling receptor grids, are presented in Tables 5.6-1 and 5.6-2, respectively. These results are based on the plant charging 2,420 TPD or 100.8 tons per hour (TPH) of MSW at projected maximum operation. The average annual concentrations have been multiplied by a factor of 0.728 to reflect the 72.8-percent annual availability of plant operation.

For most of the pollutants, the predicted maximum concentrations are below the Prevention of Significant Deterioration (PSD) significant impact levels and de minimis monitoring levels. As a result, the proposed plants' emissions do not produce a significant impact for particulate matter (PM), nitrogen dioxide (NO_2), or carbon monoxide (CO) concentrations and, therefore, do not require additional modeling analyses. For sulfur dioxide (SO_2), the maximum 3- and 24-hour concentrations are greater than the significant impact levels.

For fluorides (F^-), the maximum predicted 24-hour concentration is greater than the de minimis monitoring level. For the other regulated pollutants for which significant impact levels have not been established, the predicted maximum concentrations are well below the de minimis monitoring levels established for these pollutants. Based on these results and the existing low measured pollutant concentrations in Broward County, the proposed emissions from the NBCRR facility are expected to comply with the Ambient Air Quality Standards (AAQS) and PSD Class II increments.

Table 5.6-1. Predicted Maximum Concentrations for the Proposed NBCRR Facility at Projected Maximum Operation (110 Percent of Nameplate Capacity) Using Screening Modeling Methods

Pollutant	Averaging Time*	Maximum Concen- tration† (ug/m³)	Receptor Location** Direction (°)	Receptor Location** Distance (km)	Period Year	Period Julian Day	Period Hour Ending
SO_2	3-hour	34.4	300	1.9	1971	126	12
	24-hour	8.1	310	1.9	1972	111	24
			270	2.3	1970	169	24
	Annual	0.73	280	4.3	1970	--	--
			300	2.3, 2.7	1972, 1974	--	--
TSP	24-hour	0.68	310	1.9	1972	111	24
			270	2.3	1970	169	24
	Annual	0.061	280	4.3	1970	--	--
			300	2.3, 2.7	1972, 1974	--	--
NO_2	Annual	0.73	280	4.3	1970	--	--
			300	2.3, 2.7	1972, 1974	--	--
			270	2.3	1970	169	24
CO	1-hour	9.8	90	1.5	1973	191	11
	8-hour	3.6	310	1.5	1972	111	16
Pb	24-hour	0.029	310	1.9	1972	111	24
			270	2.3	1970	169	24
	(Quarterly)	0.0026††	280	4.3	(1972)	(--)	(--)
			(300)	2.3, 2.7	(1972, 1974)	(--)	(--)
F^-	24-hour	0.26	310	1.9	1972	111	24
			270	2.3	1970	169	24
Be	24-hour	0.000014	310	1.9	1972	111	24
			270	2.3	1970	169	24
Hg	24-hour	0.014	310	1.9	1972	111	24
			270	2.3	1970	169	24

*Annual average concentrations have been adjusted to reflect 72.8-percent annual availability factor.

†Highest, second-highest concentrations for short-term period; highest concentration for annual period. Values in parentheses represent results associated with revised de minimis monitoring levels. See Section 2.2 for details.

**With respect fo proposed facility.

††Annual average.

MALCOLM PIRNIE

Source: ESE, 1985.

Table 5.6-2. Predicted Maximum Concentrations for the Proposed NBCRR Facility at Projected Maximum Operation (110 Percent of Nameplate Capacity) Using Refined Modeling Methods

			Receptor Location**		Period			Concentrations (ug/m^3)		
Pollutant	Averaging Time*	Maximum Concentration† (ug/m^3)	Direction (°)	Distance (km)	Year	Julian Day	Hour Ending	PSD Class II Increment	Significant Impact Level	De Minimis Monitoring Level
SO_2	3-hour	34.6	300	1.9	1971	126	12	512	25	NA
	24-hour	8.4	312	1.9, 2.0	1972	112	24	91	5	13
	Annual	0.73	280	4.3	1970	--	--	20	1	NA
			300	2.3, 2.7	1972, 1974	--	--			
TSP	24-hour	0.71	312	1.9, 2.0	1972	112	24	37	5	10
	Annual	0.061	280	4.3	1970	--	--	19	1	NA
			300	2.3, 2.7	1972, 1974	--	--			
NO_2	Annual	0.73	280	4.3	1970	--	--	NA	1	14
			300	2.3, 2.7	1972, 1974	--	--			
CO	1-hour	11.0	94	1.3	1973	191	11	NA	2,000	NA
	8-hour	4.0	312	1.7	1972	111	16		500	575
Pb	24-hour	0.031	312	1.9, 2.0	1972	112	24	NA	NA	0.1
	(Quarterly)	(0.0026††)	(280)	(4.3)	(1970)	--	--		(NA)	(0.1)
			(300)	(2.3, 2.7)	(1972, 1974)	--	--			
F^-	24-hour	0.27	312	1.9, 2.0	1972	112	24	NA	NA	0.25

Table 5.6-2. Predicted Maximum Concentrations for the Proposed NBCRR Facility at Projected Maximum Operation (110 Percent of Nameplate Capacity) Using Refined Modeling Methods (Continued, Page 2 of 2)

Pollutant	Averaging Time*	Maximum Concentration† (ug/m^3)	Receptor Location** Direction (°)	Receptor Location** Distance (km)	Period Year	Period Julian Day	Period Hour Ending	Concentrations (ug/m^3) PSD Class II Increment	Concentrations (ug/m^3) Significant Impact Level	Concentrations (ug/m^3) *De Minimis* Monitoring Level
Be	24-hour	0.000014	312	1.9, 2.0	1972	112	24	NA	NA	0.0005 (0.001)
Hg	24-hour	0.014	312	1.9, 2.0	1972	112	24	NA	NA	0.25

*Average annual concentrations have been adjusted to reflect 72.8-percent annual availability factor.
†Highest, second-highest concentration for short-term period; highest concentration for annual period. Values in parentheses represent results associated with revised *de minimis* monitoring levels. See Section 2.2 for details.
**With respect to proposed facility.
††Annual average.

NA = Not applicable.

Source: ESE, 1985.

The proposed emissions for the NBCRR facility also produce predicted maximum concentrations that are less than the PSD significant impact levels and de minimis monitoring levels in the PSD Class I area in the Everglades National Park (Table 5.6-3). These results are consistent with the predicted maximum concentrations within the near vicinity of the proposed facility. Thus, the emissions for the proposed facility are expected to comply with PSD Class I increments in the Everglades National Park.

Because SO_2 emissions for the proposed NBCRR produced impacts greater than 3- and 24-hour SO_2 significant impact levels, additional modeling was performed for other major SO_2 sources within 50 kilometers (km) of the proposed facility. The other major sources considered in the analysis were FPL Port Everglades and Fort Lauderdale facilities. The predicted maximum concentrations due to the NBCRR and Florida Power and Light (FP&L) facilities added to a background concentration are presented in Table 5.6-4. These results indicate that the predicted total SO_2 concentrations will comply with national and Florida AAQS. Also, the major contributors to the maximum total concentrations are the major FPL sources, with the proposed NBCRR facility producing either no or less than significant impacts.

Because results presented in Table 5.6-4 are based on receptors for which the NBCRR facility is aligned with the FP&L facilities, modeling was also performed with the FP&L facilities for those periods which produced the highest, second-highest 3- and 24-hour SO_2 concentrations for the NBCRR facility only. As shown in Table 5.6-5, the maximum predicted concentrations are primarily due to the NBCRR facility and are similar to results presented in Table 5.6-1. In all cases, the predicted total concentrations will comply with AAQS.

The results of the screening building downwash analysis for SO_2 concentrations are presented in Table 5.6-6. The maximum concentrations

Table 5.6-3. Predicted Maximum Concentrations at the PSD Class I Area Due to the Proposed NBCRR Facility at Maximum Projected Load (110 Percent of Nameplate Capacity)

Pollutant	Averaging Time	Maximum Concentration* (ug/m^3)	Receptor Location UTM Coordinates (km) x	y	Period Year	Julian Day	Hour Ending	Concentrations (ug/m^3) PSD Class I Increment	Significant Impact Level	De Minimis Monitoring Level
SO_2	3-hour	3.2	532.75	2,847.4	1973	222	6	25	25	NA
	24-hour	0.61	532.75	2,847.4	1972	342	24	5	5	13
	Annual	0.0	All Receptors		1970–74	—	—	2	1	NA
TSP	24-hour	0.051	532.75	2,847.4	1972	342	24	10	5	10
	Annual	0.0	All Receptors		1970–74	—	--	5	1	NA
NO_2	Annual	0.0	All Receptors		1970–74	—	—	NA	1	14
CO	1-hour	1.6	532.75	2,847.4	1973	222	5	NA	2,000	NA
	8-hour	0.29	532.75	2,847.4	1972	342	24		500	575
Pb	24-hour	0.0022	532.75	2,847.4	1972	342	24	NA	NA	0.1
	(Quarterly)	(0.0)†								(0.1)
F^-	24-hour	0.020	532.75	2,847.4	1972	342	24	NA	NA	0.25
Be	24-hour	0.0000010	532.75	2,847.4	1972	342	24	NA	NA	0.0005 (0.001)
Hg	24-hour	0.0010	532.75	2,847.4	1972	342	24	NA	NA	0.25

*Highest, second-highest concentration for short-term period, highest concentration for annual period. Values in parentheses represent results associated with revised de minimis monitoring levels. See Section 2.2 for details.
†Annual average.

NA = not applicable.

Source: ESE, 1986.

Table 5.6-4. Maximum Predicted Total SO_2 Concentrations Due to Proposed NBCRR Facility and Interaction Sources

Averaging Period	Year	Highest, Second-Highest Concentration (ug/m^3) Total	Total Due to NBCRR	FPL	Back-Ground*	Receptor† Location Direction (°)	Distance (km)	Period Julian Day	Hour Ending
3-hour	1970	345	0	318	27	350	1.1	219	6
	1971	278	0	251	27	10	1.1	38	18
	1972	248	0	221	27	10	1.1	78	6
	1973	242	0	215	27	360	2.7	186	21
	1974	221	6, 7	215, 214	27	350	3.5, 3.9	175	21
24-hour	1970	95.6	0	83.6	12	10	1.9	47	24
	1971	82.9	2.6	68.3	12	350	4.3	73	24
	1972	60.5	1.4	47.1	12	350	1.9	171	24
	1973	71.1	2.2	56.9	12	10	2.3	186	24
	1974	73.9	1.0	60.9	12	350	3.9	211	24

*Based on monitoring data. Since 3-hour concentrations are not obtained by monitoring method, 3-hour concentration was assumed to equal 2.25 times the 24-hour concentration (DER, 1985).
†With respect to NBCRR. Receptors located along radials of 350, 360, and 10 degrees.

Notes: National and Florida 3-hour AAQS: 1,300 µg/m^3.
Florida 24-hour AAQS: 260 µg/m^3.
National 24-hour AAQS: 365 µg/m^3.
AAQS not to be exceeded more than once per year.

Source: ESE, 1986.

Table 5.6-5. Maximum Predicted Total SO_2 Concentrations for Periods that Produced Maximum Concentrations Due to NBCRR Facility Only

Averaging Period	Analysis	Highest, Second-Highest Concentration (ug/m³) Total	Total Due to NBCRR	Total Due to FPL	Total Due to Back-Ground*	Receptor† Location Direction (°)	Receptor† Location Distance (km)	Period Julian Day	Period Hour Ending	Period Year
3-hour	Screening**	--	34.4	--	--	300	1.9	126	12	1971
	Refined	61.6	34.6	0	27	300	2.0	126	12	1971
24-hour	Screening**	--	8.1	--	--	270	2.3	169	24	1970
						310	1.9	111	24	1972
	Refined	28.8	9.8	7.0	12	314	2.0	111	24	1972
		28.8	9.6	7.2	12	314	2.1	111	24	1972
		28.8	9.4	7.4	12	314	2.2	111	24	1972

*Based on monitoring data. Since 3-hour concentrations are not obtained by monitoring method, 3-hour concentration was assumed to equal 2.25 times the 24-hour concentration (DER, 1985).
†With respect to NBCRR.
**Screening analysis considered only NBCRR facility (see Table 7-1).

Notes: National and Florida 3-hour AAQS: 1,300 µg/m³.
Florida 24-hour AAQS: 260 µg/m³.
National 24-hour AAQS: 365 µg/m³.
AAQS not to be exceeded more than once per year.

Source: ESE, 1986.

MALCOLM PIRNIE

Table 5.6-6. Screening Analysis of Maximum SO_2 Concentrations Due to Building Downwash Conditions

Averaging Period	Analysis	Maximum Concentration (μg/m^3)* Without Building Downwash	With Building Downwash	Increase in Maximum Concentration (Percent)
3-hour	Refined	34.6	35.4	2.3
24-hour	Refined	8.4	9.0	7.1

*Based on periods which produced maximum concentrations without building downwash,

Source: ESE, 1986.

are given for conditions with and without building downwash based on the periods that produced the maximum concentrations without building downwash. These results indicate that if building downwash conditions occur, maximum concentrations could increase by approximately 7 percent from the maximum concentrations produced without building downwash. Therefore, based on this screening analysis, emissions from the proposed facility under building downwash conditions are not expected to produce concentrations that would exceed PSD increments or AAQS.

Potential Acid Rain Impacts

Acid rain can be defined as rain with high acidic content as reflected by low pH measurements. The acidity in rainfall is due to acid-forming pollutants, of which SO_2 and NO_x have been identified as the primary constituents. The effect of the proposed plant's emission on the formation of acid rain is expected to be minimal for the following reasons:

1. Acid deposition is unlikely to be an environmental problem in south Florida because reported levels of acidity and associated ions are much lower in south Florida preciptiation than elswhere in the eastern United States. For example, during 1982 and 1983, pH values in south Florida and northeastern United States precipitation were approximately 4.8 and 3.3, respectively. This difference is equivalent to an acidity factor 3 times higher in the northeastern United States compared to south Florida. Similarly, sulfate and nitrate concentrations are about a factor of 2 to 3 lower in south Florida, based on data collected by ESE for the Florida Electric Power Coordinating Group (PCG) and reported in the MAP3S precipitation chemistry network.

2. The maximum SO_2 and NO_x emissions for the proposed plant operating at maximum load for every hour throughout the year are estimated to be 1592 and 1620 TPY, respectively. Actual emissions are expected to be much lower. Based on the emission inventory for 1984 available from the Broward County Environmental Quality Control Board, the total SO_2 and NO_x emissions from area, mobile, and major point sources within Broward County were estimated to be approximately 29,800 and 46,400 TPY, respectively.

Therefore, the maximum projected SO_2 and NO_x plant emissions represent approximately 5.3 and 3.5 percent, respectively of countywide emissions. On a statewide basis, the proposed plant's maximum emissions represent less than 0.3 percent of total anthropogenic emissions.

3. The meteorological conditions in south Florida are condusive to the dispersion of air pollutants. For example, the air dispersion modeling performed for the proposed plant indicate very low simulated impacts, primarily due to the relatively low emission rates and the capability is demonstrated by the relatively high wind speeds, low occurrence of calm conditions, and low occurrence of fog formation along Florida's southeast coast as compared to sites located in Florida's northern peninsula and panhandle areas.

   Also, the calcitic and dolomitic soils of south Florida have been estimated to have especially low sensitivity to acid deposition (reported by U.S.-Canadian Memorandum of Intent (MOI) on Transboundary Air Pollution, 1982).

   The natural water bodies of south Florida also are relatively resistant to acidification. They host flora and fauna that appear to have natural tolerances of acidity not exhibited by related species in temperate ecosystems (reported by ESE for the FCG report).

   Therefore, no significant additional impact is expected as a result of these emissions.

5.7 Noise

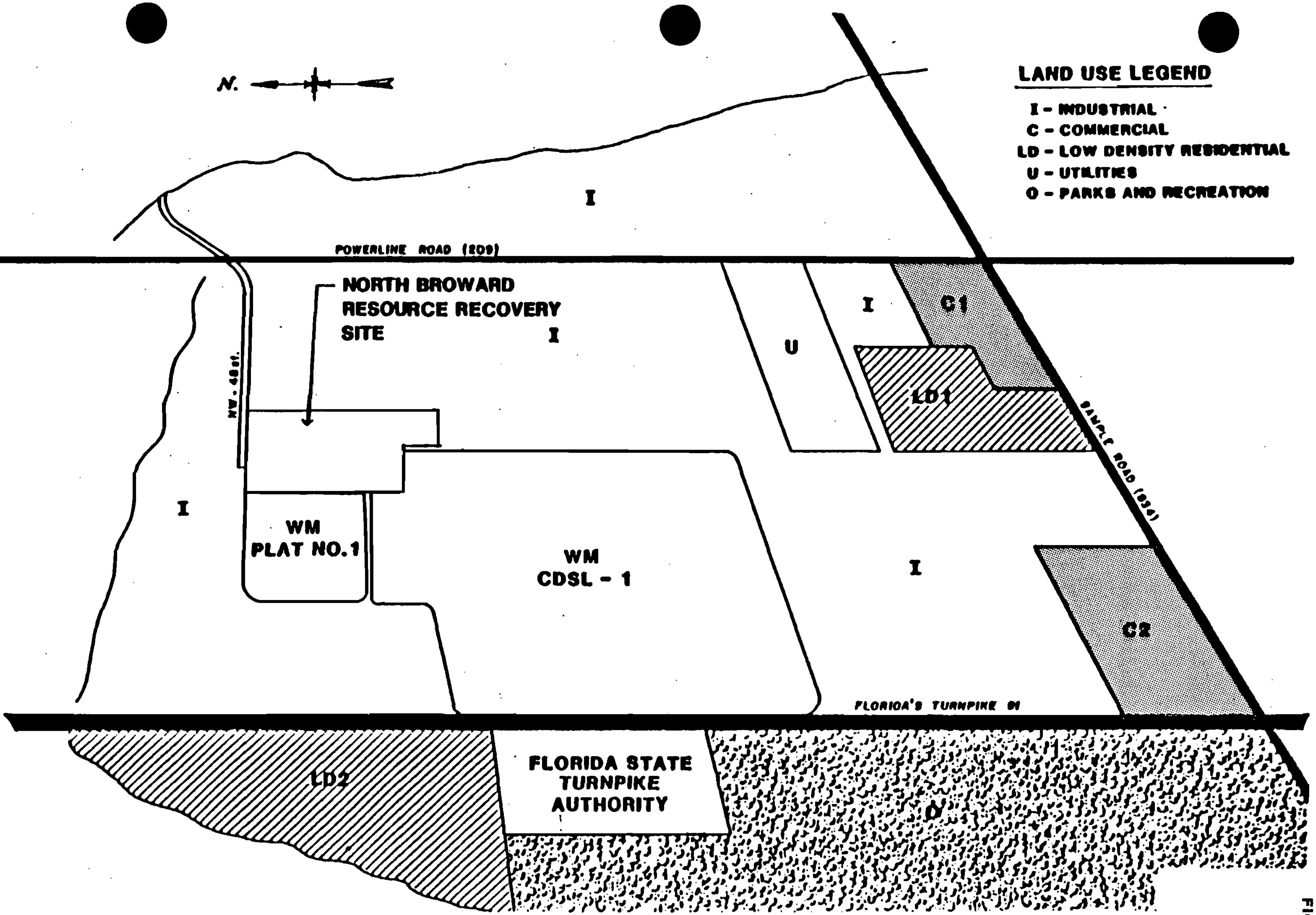
Noise baseline data and conditions are discussed in Section 2.3.8. Noise monitoring sites are illustrated in Figure 2.3.8.1 in Section 2.3.8 as well. In addition, baseline sound levels are shown in the same section (Table 2.3.8.1).

From the analysis presented in Appendix 10.10, the projected noise levels produced by the proposed facility at sensitive boundaries (Figure 5.7.1) will range from 31.9-60.3 dB(A). It is projected that any noises generated on-site will be attenuated adequately to ensure compliance with the applicable County regulations. This is based on an analysis of noise attenuation from the pont of origin to all sensitive boundaries. As such, noise impacts with respect to various zoning classification criteria are projected to be in compliance with zoning standards. Table 5.7.1 is a summary of the projected noise levels at the receptors as compared to the standards set forth in the Broward County Code of Regulations, Chapter 27-7. Table 5.7.2 is a list of common noise levels.

Appropriate mitigation measures for reducing expected noise levels are included in the design of the Project. Different forms of noise control measures include equipment enclosures, absorption materials, barriers, mufflers, logging and vibration damping and insulation. Steam vents and safety valve vents will be muffled.

Special attention will also be given to refuse handling and preparation area, since this area is generally open for refuse trucks to unload.

There will be approximately a 30 percent decrease in vehicular traffic on Hilton Road (NW 48th Street) as a result of the facility. Traffic presently using the adjacent landfill will be directed to the facility instead. Also, trucks operating on a public right-of-way are exempted from noise control provisions.



BROWARD COUNTY

RELATIVE LOCATION OF RECEPTOR ZONES

FIGURE 5.7.1

TABLE 5.7.1

OPERATING dBA PROJECTED NOISE LEVELS AT RECEPTORS

Equipment	On Site	C1	C2	LD1	LD2	U	I
Refuse Handling	66	24.0	25.0	31.5	35.0	33.3	48.2
Turbine Generator	51	11.6	11.5	18.7	18.4	17.2	37.7
Cooling Tower	68	28.9	28.2	36.0	34.4	33.2	59.0
APC System	64	25.8	26.3	33.0	32.8	31.6	51.8
Residue Handling	61	20.5	23.0	28.8	32.4	31.0	48.1
Distance, feet		3835	4059	3796	3076	3476	478
Sound Level Limit		65	65	55	55	65	70
Combined Level	71.5	31.9	32.1	39.1	39.8	38.4	60.3

COMMON OUTDOOR LEVELS	INDOOR LEVELS	NOISE LEVEL (dBA)	RESPONSE	CONVERSATION RELATIONSHIPS
Carrier Deck, Jet Operations		140		
		135		
		130	Limit Amplified Speech	
		125		
Jet Takeoff, 200 Ft.	Discotheque	120	Maximum Vocal Effort	
Auto Horn, 3 Ft.				
		115		
	Rock Band Riveting Machine	110		
Jet Flyover, 1000 Ft. Jet Takeoff, 2000 Ft.		105		Shouting in Ear
		100	Very Annoying Hearing Damage	
Gas Lawn Mower, 3 Ft. Pneumatic Drill, 50 Ft.	N.Y.C. Subway	95		Shouting, 2 Ft.
Diesel Truck, 50 Ft.	Food Blender, 3 Ft.	90	8 Hours - Annoying	
		85		Very Loud Conversation, 2 Ft.
Noisy Urban Daytime	Garbage Disposal, 3 Ft.	80		Loud Conversation, 2 Ft.
Freight Train, 50 Ft.	Shouting, 3 Ft.	75		
Gas Lawn Mower, 100 Ft. Freeway Traffic, 50 Ft.	Vacuum Cleaner, 10 Ft.	70	Telephone Use Difficult	Loud Conversation, 4 Ft.
Commercial Area	Normal Speech, 3 Ft.	65		
	Air Conditioner, 20 Ft.	60	Intrusive	
	Large Business Office	55		Normal Conversation, 12 Ft.
Quiet Urban Daytime Light Auto Traffic, 100 Ft.	Dishwasher, Next Room	50	Quiet	
		45		
Quiet Urban Nighttime	Small Theatre (Background)	40		
Quiet Suburban Nighttime	Library	35		
	Bedroom at Night	30	Very Quiet	
Quiet Rural Nighttime	Concert Hall (Background)	25		
		20		
		15		
		10	Just Audible	
			Threshold of Hearing	

MALCOLM PIRNIE

BROWARD COUNTY

COMMON NOISE LEVELS

There are a few measures available to mitigate on-site and off-site potential traffic-related noise impacts which can be utilized during design and operation of the proposed facility. These include the following:

- o Maintain trucks and especially exhaust silencer systems.
- o Design and operate facility such that traffic flows will be facilitated to minimize trucks stopping and queuing.
- o Use of sound barriers near property boundary sites.

5.8 Changes In Non-Aquatic Species Populations

5.8.1 Impacts

Long-term impacts to non-aquatic species populations resulting from plant operations are anticipated to be insignificant. There would be no anticipated changes in diversity, relative abundance, species composition, distribution, dominance, or gradient distribution of important non-aquatic species.

5.8.2 Monitoring

No long-term monitoring programs are proposed because significant impacts to non-aquatic species populations are not expected.

5.9 Other Plant Operation Effects

Auxiliary Burners - On a preliminary basis, auxiliary burners, located in the combustion chamber, may be utilized during start-up and shutdown procedures. The burners are expected to be operated for two continuous hours during each procedure. The burners will utilize either fuel oil or natural gas should natural gas be available in sufficient quantity.

Mass emissions would be less than those projected for the processing of solid waste. Given that the information presented in the Certification Application demonstrates that emissions from the processing of solid waste would result in compliance with ambient air quality standards by a wide margin, we believe that it is reasonable to assume the operation of auxiliary burners would also result in compliance with such standards.

Spent Oils - Spent oils used as lubricants in the rotating machinery will be collected separately and disposed at an approved facility. An oily-water separator for wash water runoff from maintenance and scalehouse areas will be provided if required by local wastewater discharge regulations.

Odors - The tipping area and waste storage area will be totally enclosed. The air intakes will be adjusted to allow sufficient air flow to satisfy combustion requirements. The facility is designed to be partially operational at all times. Multiple processing lines are planned which can run practically independently. Where common elements are present, redundant systems are provided or alternative equipment in place to allow continued operation. If the entire plant is down for a prolonged length of time, refuse will not be accepted and stored waste will be removed from the pit. Therefore, odors will not be a problem.

Truck Traffic - Estimates of the truck traffic that will be required to transport waste to the facility, including trips from the facility after trucks have unloaded their waste, were utilized to project traffic impacts on the local access roads. Table 5.9.1 presents the results of these estimates. Vehicle trips expected on each of the impacted roadways and the percentage decrease is presented. As the figures on Table 5.9.1 indicate, there will be a minor decrease in traffic on Powerline Road and a 30 percent decrease in traffic on Hilton Road (48th Street). In addition, since both the resource recovery facility and the unprocessable ash/residue landfill will be located near the same site, there will be no need to haul ash residue over

TABLE 5.9.1

BROWARD COUNTY RESOURCE RECOVERY FACILITY
HILTON ROAD SITE

PROJECTED TRAFFIC IMPACTS

	Average Daily Traffic Counts	Landfill Traffic	Facility Traffic[1]	Percent Decrease[2]
NW 48 Street (west of Powerline Rd)	2,100	1,680	1,140	30%
Powerline Rd. (between NW 48 & SW 10)				
Northbound	12,800	76	57	<1%
Southbound	9,800	76	57	<1%
Powerline Rd. (between NW 48 & Sample Rd)				
Northbound	14,200	684	513	1%
Southbound	13,300	684	513	1%

1. It has been assumed that 80 percent of the existing traffic on 48th Street will be trucks that will no longer use this landfill once both of the resource recovery facilities in Broward County are in operation. Approximately 90 percent of these trucks travel south on Powerline Road while approximately 10 percent travel north.

2. Based on a maximum facility throughput of 3,300 tons per day and refuse truck capacities of 6.5 tons per truck, approximately 500 trucks and 70 employee vehicles would be generated due to facility operations. This would result in 1,140 vehicle trips per day.

3. Facility traffic will replace estimated existing traffic to landfill. Decrease is calculated as percent of existing traffic counts.

public roads, thus eliminating traffic and environmental impacts associated with the hauling of ash residue. The incoming refuse trucks will be covered. Therefore, the amount of debris potentially deposited along the access roadways will be minimized. Designated areas for cleaning trucks will be provided to minimize spillage by exiting trucks. Refuse inadvertently deposited will be periodically cleaned by plant personnel including off-site patrols on nearby roads as necessary.

5.10 Archaeological Sites

The State of Florida, Division of Archives, History and Records Management stated that a review of the Florida Master Site File indicates that no archaeological or historic sites are recorded for the Project area. From their review they concluded that the proposed Project will have no effect on any sites listed or eligible for listing, in the National Register of Historic Places (see Appendix 10.16).

5.11 Resources Committed

Some of the resources committed to the Project will be consumed and converted and hence, be unavailable for future use once the Project is complete.

Resources and materials used in the construction phase of the project would be committed to the project. Building materials would be consumed and thus irretrievably used in the facility's construction. Lumber and concrete would be committed, as well as:

- o glass products
- o ceramics
- o paint
- o metals
- o insulation
- o electrical equipment, and
- o piping

In addition, human labor and energy utilized in the construction of the facility would be irretrievable. However, all of the above is typical of the commitment of resources necessary to bring to fruition a major capital project such as the North Broward County Resource Recovery Project.

Some significant financial commitments already have been made to the project. Approximately $3 million has already been spent on acquisition of the site and another $5-7 million has been spent on other development activities. In addition, approximately $521 million in Industrial Revenue Bonds have been sold to finance the southern Route 441 and northern Hilton Road resource recovery projects. The Hilton Road facility will serve approximately 40 percent of Broward County residents. The commitment of finances, like labor and materials, is typical for a major project of this nature.

The mass-burning combustion process will chemically alter many of the compounds contained in the waste stream in a positive way (i.e., raw garbage is turned into a relatively inert ash residue). Materials thus consumed in the combustion process are converted to energy a large portion of which is recovered. This is considered a positive result of the combustion process since the materials burned will generate electricity. Otherwise, these same materials would have to be buried consuming landfill capacity. In contrast, the mass-burning of a projected ultimate capacity of approximately 3,300 tons per day at the facility could result in the conversion of up to one million tons of municipal solid waste per year into energy equivalent to one million barrels of crude oil.

5.12 Variances

As described previously, at this time no known variances from applicable standards will be required as part of the state certification program for the proposed resource recovery facility.

SECTION 6

TRANSMISSION LINES AND OTHER LINEAR FACILITIES

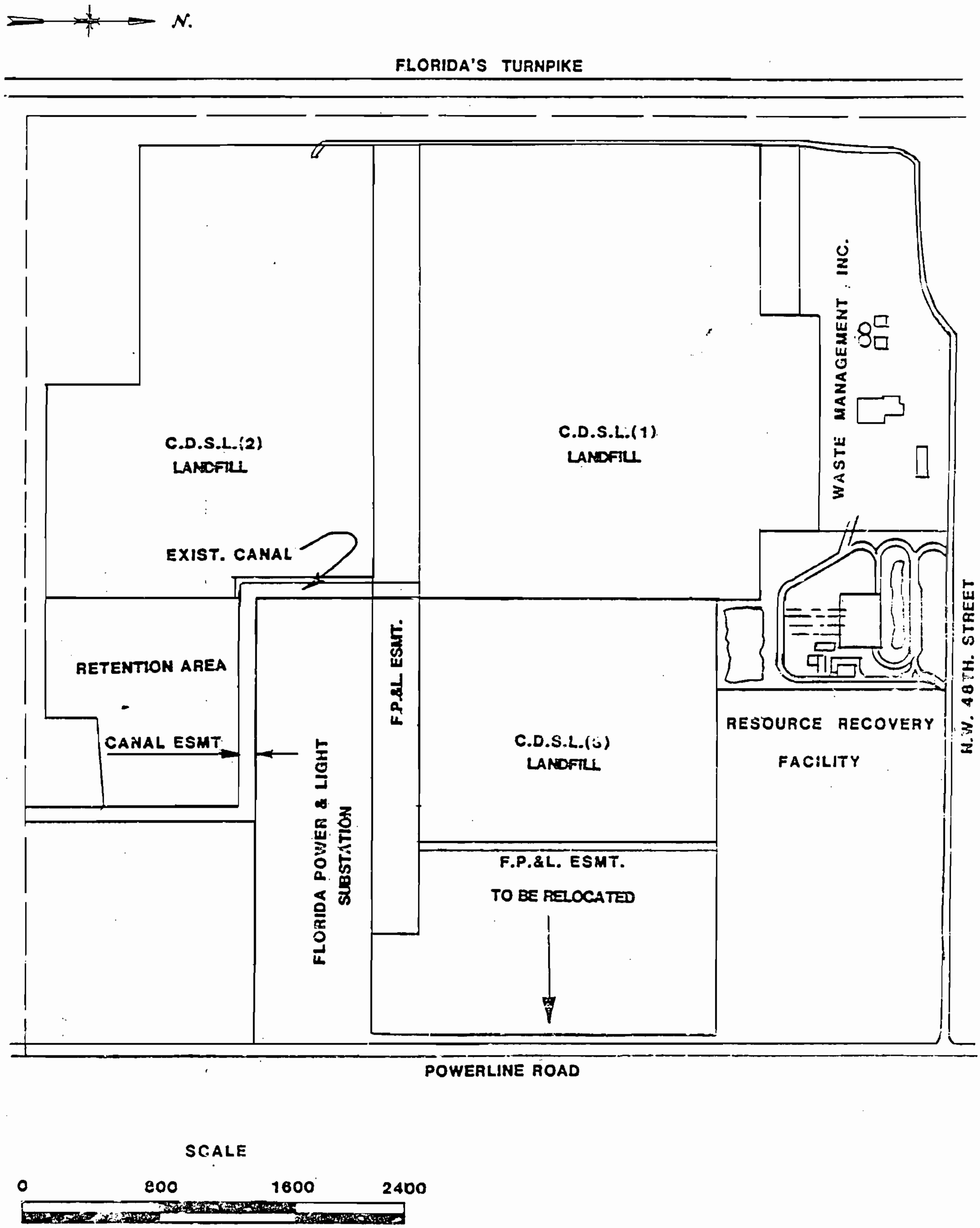
Based upon discussions with Florida Power and Light, Company (FP&L) officials and their preliminary investigation of electrical interconnection requirements, the existing FP&L transmission line is to be relocated along Powerline Road as a part of Central Disposal Landfill Cell 3. Figure 6.1.1 illustrates the general location of the electrical utility (FP&L) with respect to the site. Access to these transmission lines from the facility to FP&L will be readily available.

Since the transmission lines will not be located outside of the project site area, information pertaining to transmission lines and other linear facility impacts are consistent with the information pertaining to the site. The information requested in the permit application guidelines and identified as Sections 6.1.1 through 6.1.10, as well as 6.2 has been provided in Section 2 through Section 5.

6.1 Electrical Power

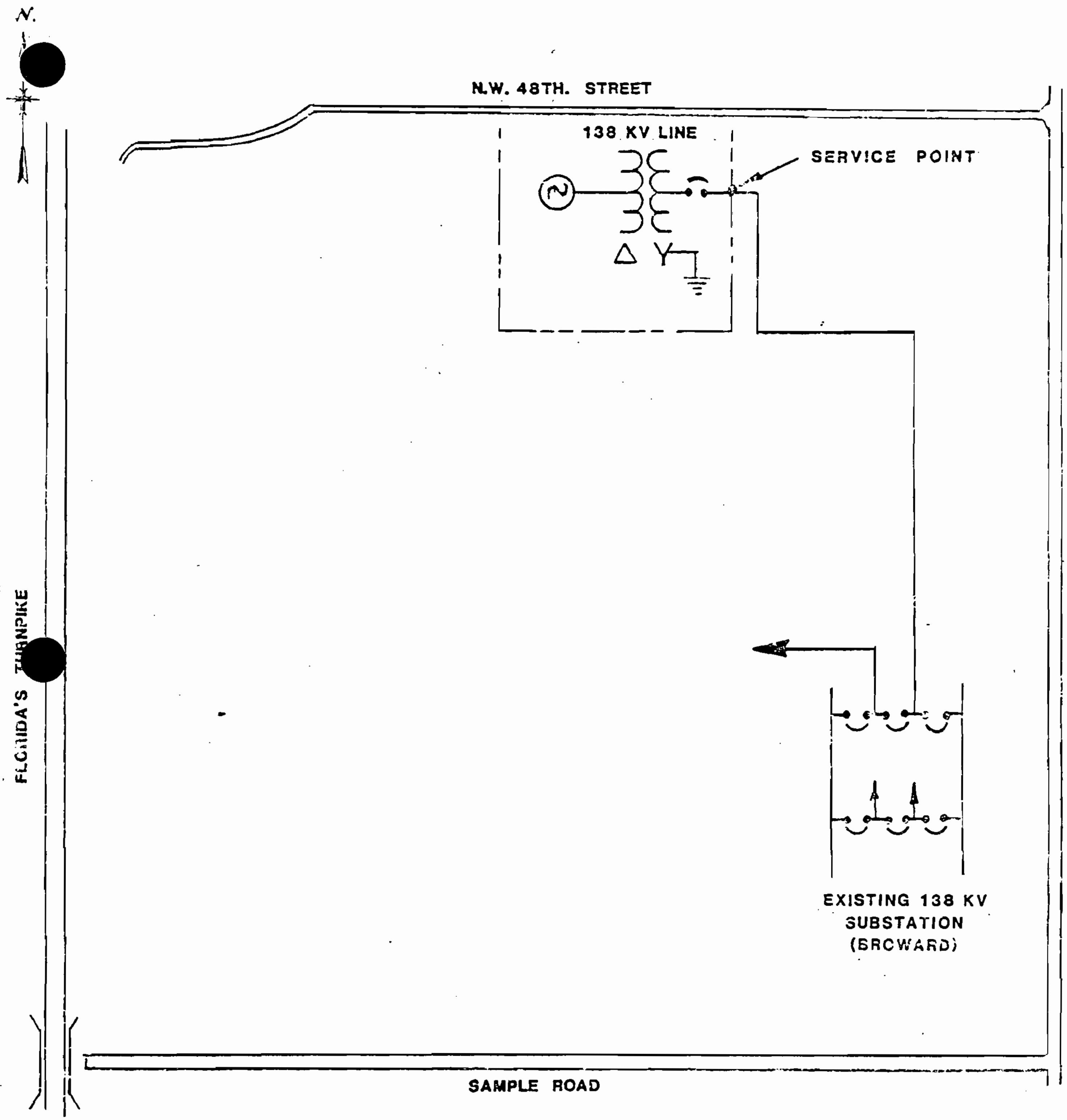
Florida Power & Light will bring transmission power to the facility substation. The electrical interconnections proposed by FP&L are shown in Figure 6.1.2. FP&L indicates that a 138 KV transmission line will be extended northward along Powerline Road from FP&L's switchyard to the facility substation. The routing of this line will require coordination in the development of the proposed Central Disposal Landfill Cell 3 development and resource recovery plant.

The design and installation of all electrical interconnections, meters, plant distribution systems and protection equipment will be in accordance with the requirements and standards imposed by FP&L. FP&L will tie-in to the electrical substation to be located within the facility site.



BROWARD COUNTY

RESOURCE RECOVERY SITE &
UTILITY LOCATIONS



BROWARD COUNTY

RESOURCE RECOVERY ELECTRICAL
INTERCONNECTION SCHEMATIC
WMI SITE

The mode of electrical energy distribution shall include the following:

- o The turbo-generator and associated power generation equipment will have its own bus which will be at the same voltage level as the generator. Synchronizing and protective relays will be provided on each generator breaker.
- o Interconnect transformers will each be sized for the full output of the plant.
- o Complete indoor relay and control switchboards will be provided for the facility's electric systems.

The distribution systems will have 4.16 KV and 480 volt systems with switchgear and related accessories housed in the processing section of the facilities.

The electrical output of the turbine-generator set will operate within the interconnection system established by FP&L. The turbine-generator set will be capable of operating in the full condensing mode, at maximum steam flow, even on the hottest day of the year, and still provide an efficient and adequate quantity of electrical energy.

6.2 Projected Interconnection Costs

Florida Power and Light has developed an interconnection cost estimate, including modifications to offsite substations and transmission lines, for the site. This estimate is $600,000 which does not include the cost of the transformer, circuit breaker or protective equipment installed at the site.

In addition, payment to FP&L will be required for interconnection and protection costs associated with the facility electrical interconnections, and for the following additional costs:

- o Monthly telephone company charge for FP&L dispatcher communication channel, which has been estimated by FP&L at $175 per month.
- o Maintenance and operation fee to FP&L for interconnections facilities.

- Metering costs.
- Suitable arrangements for termination of FP&L lines. The service points may be adjusted if desirable to provide suitable line terminations.
- Costs of all fees and permits, if applicable, will also be paid.

The above costs, in current dollars, should be regarded as a budget estimate. Since the Project will pay on the basis of actual cost including appropriate overheads, rather than estimated cost, the estimates may change when specific designs become available.

SECTION 7

ECONOMIC AND SOCIAL EFFECTS OF PLANT CONSTRUCTION AND OPERATION

For many areas, such as Broward County, an environmentally sound waste-to-energy facility can provide the best long-term solution to a solid waste disposal problem. A properly sited resource recovery facility using proven technology becomes a valuable asset to the community. The measurable costs associated with the proposed facility development should have a minimal impact on the facility users, and associated benefits far outweigh any additional costs.

The resource recovery project will:

- Provide an environmentally sound and economically viable means for the disposal of solid waste over the long-term (20 or more years),
- Decrease the potential threat to groundwater and land use as the need for disposal of raw garbage in landfills is eliminated,
- Recover energy for sale thereby establishing a revenue stream that will offset the cost of disposal,
- Reduce the need to consume natural energy sources such as gas, oil and coal, and
- Stabilize or reduce future disposal cost escalation.

The following discussion addresses the socio-economic benefits and the costs associated with the proposed project.

7.1 Socio-Economic Benefits

7.1.1 State and Local Government Tax Revenues

Between $1.9 and $2.2 million in local tax revenues will be generated by the North Broward County Resource Recovery Project, Inc. based on Fiscal Year 1986 millage rates from the 1985 tax roll. Taxing authorities benefitting from this Project include Broward County, the Unincorporated Municipal

Service District, Broward County School Board, North Florida Water Management District, North Broward Hospital District, North Broward Park District and Fire Assessment.

State sales tax will be paid on equipment and materials not associated with pollution control for the Project.

7.1.2 Creation of Temporary and Permanent New Jobs

In addition to providing the County with an economical and environmentally responsive long-term solid waste disposal system which removes the major technical, operating, and business risks from the County at the lowest net cost, the County's local economy and labor market will also benefit from the project. Construction and Service Agreements between Waste Management, Inc. and the County include provisions for hiring local construction labor and businesses including use of minority subcontractors in accordance with the County's Disadvantaged Business Enterprise Affirmative Action Program.

It is anticipated that local construction and equipment suppliers will realize both direct and indirect benefits from the construction and operation of the resource recovery facility. Approximately 380 construction workers will be employed on the facility at the peak of activity.

The facility itself, once operational, will become an integral part of the local economy and community as a whole. An operational work force in excess of 57 people will be required to run the facility. It is estimated that a payroll of over $4 million will offer the County economic stimulus. About 25 percent of available income ($1 million) will boost retail sales. An estimated additional $1.5 million in personal income will be realized by local residents and over 100 non-manufacturing jobs will be a direct result from project implementation. On the aggregate a total of $5 million in estimated annual economic benefits to the economy of Broward County will be realized as a direct result of this facility.

7.1.3 Environmental Benefits

The primary benefit associated with the development of a resource recovery facility in Broward County is the reduced reliance on sanitary landfills, efficiency and effectiveness of the process itself, and its ability to provide an environmentally secure method of solid waste disposal.

The facility proposed for northern Broward County will have an initial installed nameplate capacity of approximately 803,000 tons per year of solid waste. This represents a significant reduction in the amount of waste requiring landfilling. The facility is designed so that increases in waste generation can be accommodated by facility expansion up to a projected ultimate capacity of 1,200,000 tons per year.

Although the majority of solid waste delivered will be processed at the facility, some unprocessable (by-pass) waste will still need to be landfilled. In addition, the combustion process will produce an ash residue that will require landfilling. The ash residue will represent approximately 10 percent of the processable waste's original volume and represents an environmentally secure waste product for disposal. The site chosen for the North Broward Resource Recovery Project is adjacent to Waste Management's existing Central Disposal Landfill.

Through a public awareness program, many County residents have already come to realize the pressing environmental problems of solid waste disposal in the County. Information pertaining to all facets of the completion of this project will be invaluable to other municipalities considering resource recovery.

Groundwater and Surface Water Protection

Another benefit resulting from the construction and operation of the resource recovery facility will be the reduced potential for damage to both groundwater and surface water. Unprocessed solid waste that is disposed of at a landfill has the potential to contaminate water resources through the leaching of metals and organic compounds. Solid waste processed in a mass-burn resource recovery facility, as mentioned, produces an ash residue that is basically inert. This residue is required by specifications to consist of less than 4.0 percent combustible material and 0.3 percent putrescible material.

Hydrogeological Field Investigtion Program

A hydrogeological field investigation program has been conducted at the Project site in accordance with the Florida Department of Environmental Regulation (FDER) Chapter 17-7 -- Resource Recovery and Management; Part I requirements (See Appendix 10.8). This program provides subsurface information at this site. The principal elements of the field investigation are:

- Installation of soil borings to assess shallow subsurface geologic and hydrogeologic conditions and depths to ground water.
- Inventory of active wells within several miles to the south of the site.
- Water level measurements in the general area to assess ground water flow conditions.

The principal study outputs are as follows:

- Definition of shallow subsurface geologic conditions.
- Assessment (from existing reports) of regional ground water flow and quality conditions.

(For a more detailed discussion of this program, see Section 2.3).

7.1.4 Creation of a Source of Heated Discharge

The Project will not create a source of heated discharge.

7.1.5 Visitor Accommodations

On-site public education programs will be provided for individuals and groups visiting the North Broward Resource Recovery Facility.

In addition, controlled visitor viewing locations, in various process areas of the facility, will be provided.

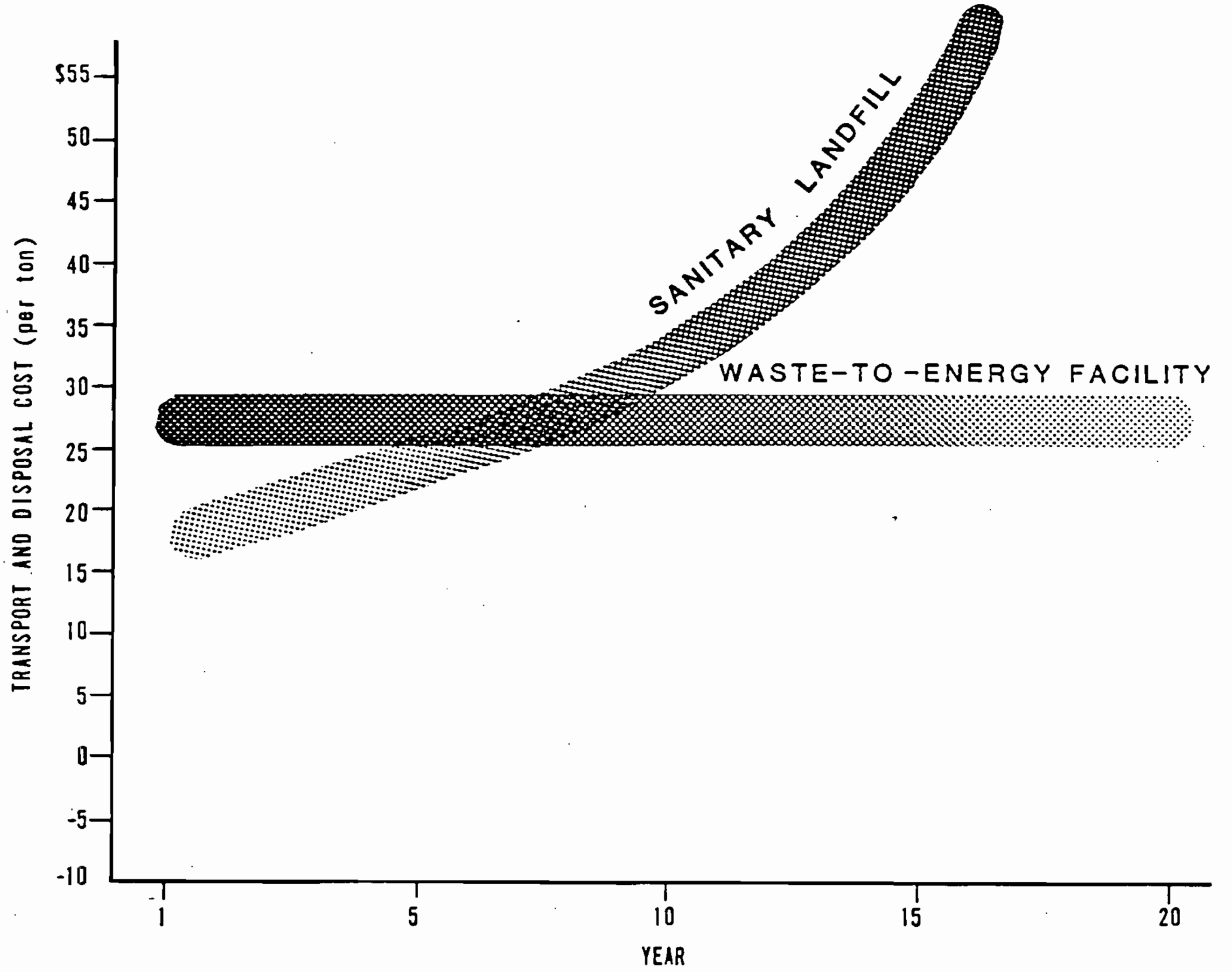
7.1.6 Economic Benefits

Figure 7.1.6.1 illustrates typical costs of solid waste disposal for both a sanitary landfill and waste-to-energy facility over a twenty year period. As shown, landfill costs generally increase at a faster rate and eventually surpass the costs associated with resource recovery development. There are a myriad of reasons for the continuous increase in land disposal costs:

- o Higher land and real estate escalation costs.
- o Higher transportation costs to and from landfills located further and further away from urban centers.
- o Higher permitting and operating costs, including daily cover, landfill liners, leachate and methane collection systems, and the need for a sinking fund accrual account for post-closure maintenance and monitoring.

Alternatively, a waste-to-energy project can result in a stabilized or decreased net cost for waste disposal over the life of the project. The reasons for this are:

- o Capital costs are fixed for the facility's life.
- o Only operating and maintenance expenses are subject to inflation.
- o Expected rising energy rates will offset increasing operating and maintenance costs.



* The curves shown on this figure represent current waste disposal cost trends. They may vary by community depending on current landfill life and disposal costs, waste-to-energy facility cost and energy rates.

MALCOLM PIRNIE

BROWARD COUNTY, FLORIDA

RESOURCE RECOVERY PROJECT
ESTIMATED SOLID WASTE DISPOSAL COST

Resource recovery (waste-to-energy), although often more expensive initially than landfilling, usually becomes less expensive over the life of the project.

7.1.7 Energy Benefits

A significant benefit that will be realized once the facility becomes operational, is the generation of electric power. Approximately 305 million kilowatt hours (kwh) of electricity will be generated initially per year. It is likely that the electrical output will be significantly higher since the 305 million kwh estimate is based on a minimum guaranteed tonnage of 642,400 tons per year and a conservative electrical generation rate of 475 kwh per ton.

There is approximately a one-to-one fuel value relationship between garbage and crude oil (i.e., one ton of garbage equals approximately one barrel of crude oil). Thus, at a minimum, 642,400 barrels of crude oil per year or 12.9 million barrels of crude oil over the life of the project will be conserved. Assuming a conservative inflation rate (4 percent over the life of the project) the net present worth of the annuity relative to the conservation of 12.9 million barrels of imported crude oil is approximately $139 million.

Although revenue generated from the sale of electricity will be the property of the vendor (owner and operator of the facility), users of the facility will share the revenue benefits in the following manner:

- o Projected revenues are included in the vendor's tip fee calculation thereby reducing the cost of solid waste disposal.

- o The users will benefit from power sharing if rates for purchase of electricity escalate at a more rapid rate than inflation, thereby further reducing disposal costs.

7.2 Socio-Economic Costs

There will be both direct and indirect costs associated with the construction of the resource recovery facility. The costs will be borne by the users of the facility over the twenty year life of the project. This section discusses both the direct and indirect cost streams resulting from the construction and operation of the proposed facility.

The County has selected Waste Management, Inc. as the full-service vendor for the construction and 20 year operation (plus addition of 5 year County and 15 year contractor option periods) of the resource recovery facility. The full-service vendor will be the owner operator of the facility. The County will be prime customer of the Project. Under this approach, the County expects Waste Management, Inc. to take on the substantial risks of construction, operation and marketing of solid waste disposal and energy output of the facilities as well as residue/unprocessable waste landfilling responsibilities. Ownership of the Project for federal income tax benefits will reside with Waste Management, Inc. The County also expects the vendor to pass through a substantial portion of the federal tax benefits available to the vendor, in the form of an up-front equity contribution during the construction period, which will serve to reduce the amount of bonds required to be issued and lower the net tipping fee.

Based on the final proposal submitted by Waste Management, Inc., the following presents a synopsis of the total estimated costs required for development of the Project.

Cost

The major cost components associated with the Project include the resource recovery facility construction, other related development cost, is site acquisition and development costs, and acquisition costs. The total costs have been reduced by a factor equaling the vendor's contribution (equity) to the project. The total cost to purchase the site and make it available for resource recovery construction will be approximately $3,000,000 or $150,000 per acre. To service the debt over the twenty year life of the project, including the cost of annual principle and interest, capitalized interest and debt service reserve fund, an assumed debt service factor of .175 is used. The preceding assumptions together with the cost proposals submitted by the Waste Management, Inc., a range of estimated capital costs were developed for the proposed Project and are presented in Table 7.2.1. These costs are subject to change during the final design and construction, however, they represent the best available estimates at the present time.

In addition to the preceding capital costs, estimates have been made for the operations and maintenance costs of both the resource recovery facility and disposal of ash residue and for the annual revenues anticipated from the facility. The following Table 7.2.2 presents projected annual operating costs and revenues (including interest income) for the proposed resource recovery facility and established a range for the net tipping fee.

The total capital and annual operating costs for the project are provided in order that a comparison can be made between present and future landfilling costs and the proposed resource recovery project.

At the present time, the cost to dispose of a ton of garbage is $25. The fee is expected to increase to $35/ton over the next few years. The upper estimate of the tip fee for disposing of a ton of garbage at the resource recovery facility in 1985 dollars is projected to be approximately $39. Therefore, the cost differential between the resource recovery facility compared to existing landfilling is approximately $14 per ton. As previously discussed this cost differential is expected to decrease as landfill costs increase.

TABLE 7.2.1*

CONSTRUCTION (CAPITAL) COST
(000's)

		Facility
A.	Design and Permitting	$10,923
B.	Site Work	
	1. Excavation and Fill	$ 2,452
	2. Foundations	5,292
	3. Parking Area and Roadways	655
	4. General Site Work - Fences, Grates Lighting, Grading, etc.	1,209
	5. Landscaping (Included Above)	-
	6. Sanitary Sewer (Included Below)	-
	7. Water Supply	423
	8. Storm Sewer (Included Above)	-
	9. Utility Installation	317
	10. Building(s) and Structure(s)	23,862
	Subtotals	$45,133
C.	Combustion Plant	
	1. Furnace	$34,170
	2. Grates	2,528
	3. Boiler	17,701
	4. Superheater (Included Above)	-
	5. Economizer (Included Above)	-
	6. Fuel Handling Equipment	1,941
	7. Ash Collection Equipment	3,035
	8. Process Control Equipment	2,305
	9. Water Treatment Facility	2,407
	Subtotals	$63,727
D.	Cooling Systems	$10,814
E.	Air Pollution Control	$11,854
F.	Stack	$ 2,529

*Table 7.2.1 was excerpted from Waste Management, Inc. Final Project Contracts dated May 31, 1985.

TABLE 7.2.1* (continued)

CONSTRUCTION (CAPITAL) COST
(000's)

		Facility
G.	Power Plant	
1.	Turbine	$25,099
2.	Generator (Included Above)	-
3.	Switchgears	2,399
4.	Transformers	2,892
5.	Transmission Lines	-
6.	Standby Electric Services	1,517
	Subtotals	$31,907
	Miscellaneous Mobile Equipment (Included Above)	-
	Project Totals	$165,964

*Table 7.2.1 was excerpted from Waste Management, Inc. Final Project Contracts dated May 31, 1985.

TABLE 7.2.2*

ANNUAL OPERATING COSTS AND REVENUES
(including interest income)

Cost Component	Estimates ($ in million)
Annual Debt Service	24.5
Operations and Maintenance of Resource Recovery Facility and Landfill	8.0
Total Annual Cost	32.5
Revenues	
Electrical Power Sales	13.7
Interest Income	2.7
Non-County Tipping Fee	4.6
Proposers Adjustment	1.5
Net Tipping Fee	13.0

*Annual Operating Costs and Revenues was excerpted from Waste Management, Inc. Final Project Contracts dated May 31, 1985.

MALCOLM PIRNIE

Even with the expectation of an increase in cost per household to support this Project which will provide an environmentally secure alternative to the landfilling of processable solid waste, the applicant believes the benefits described in the preceding subsections clearly outweigh the costs associated with the resource recovery facility.

To acquire and develop a new landfill site, which would be required if the County does not go ahead with this Project, would cost more than $8 per ton over its available life. Therefore, in real dollars, no additional cost to dispose of garbage in the initial year of resource recovery operation is expected.

The following potential temporary costs and impacts have been considered through the course of the project.

Shortages of housing	None
Inflationary rentals or prices	None
Congestion of local streets and highways	Construction
Noise	Construction
Temporary aesthetic disturbance	Minor
Overloading of water supply and sewage treatment facilities	None
Crowding of local schools	None
Crowding of hospitals	None
Crowding of other public facilities	None
Overtaxing of community service	None
Disruption of lives or local community caused by acquisition	None

7.2.1 Long-Term External Costs and Benefits

Long-term external costs and benefits have been previously discussed throughout this report.

SECTION 8

SITE AND DESIGN ALTERNATIVES

8.1 Alternative Sites

To identify the most appropriate site for development of the North Broward County Resource Recovery Project, Broward County has undertaken a comprehensive site selection process which was initiated in 1981 and completed in 1983.

Initially, the site evaluation process for the Broward County resource recovery program involved the identification of one site for the construction of a resource recovery facility and a second site for the development of a new sanitary landfill.

In 1981, the former Broward County Solid Waste Division identified five prospective landfill sites and three prospective resource recovery facility sites for detailed evaluation. The criteria used to select these sites included:

- o general location
- o jurisdiction (unincorporated vs. incorporated areas)
- o size
- o existing zoning
- o land use plan designation
- o existing land use

The potential sites that were identified were:

LANDFILL

- Broward Correctional Institute (BCI) - This site represents between 480 and 710 acres surrounding the State of Florida Women's Correctional Institute located between Stirling Road and Sheriden Street near U.S. 27 in West Broward.

- Chapel Trail - This site consists of approximately 1830 acres located northeast of the intersection of Hollywood Boulevard and U.S. Route 27.

MALCOLM PIRNIE

- Sportatorium - This site consists of approximately 440 acres located north of Hollywood Boulevard. The Sportatorium and the Miami/Hollywood Speedway are located on this site.

- Davie - This site is comprised of approximately 420 acres located adjacent to the existing Broward County Sanitary Landfill at the northwest intersection of Orange Drive and Shotgun Road.

- Markham Park - This 150 acre site is located in the eastern portion of the park, north of State Route 84 and west of Southwest 148th Avenue.

RESOURCE RECOVERY

- Fort Lauderdale Incinerator - This site is located on N.W. 31st Ave. in the City of Fort Lauderdale. It contains a City incinerator that is no longer in operation, and is currently used to park Department of Public Works sanitation vehicles.

- Route 441 - This site is located at the southeast intersection of U.S. Route 441 and State Route 84.

- Port Everglades - While a specific site had not been identified by the County, a tract bounded on the east by the Intracoastal Waterway and along the west and south by a discharge basin was reviewed.

An investigation of available information and on-site inspections was performed by Malcolm Pirnie, Inc. for each of the identified sites to assess:

- o Adequacy of site to contain the project
- o Proximity of site location to energy market(s)
- o Existing solid waste collection and transportation practices
- o Ability of the immediately adjacent transportation network to accommodate added collection vehicular traffic and associated loading
- o Conditions of existing roads to withstand vehicular loads
- o Identification of environmental and social constraints and existing land-use ordinances

- Number of permits/approvals required for project development and the probability of obtaining the required approvals

The results of this evaluation were presented in a Malcolm Pirnie Site Evaluation report dated February 1982. These results indicated that the Route 441 site was the most promising of the potential resource recovery sites identified by the County. This was based upon the proximity of this site to the solid waste centroids, the adequacy of the access roadway system, the amount of acreage available for site development and the relative probability of receiving the required regulatory permits.

To verify the results of these initial studies, supplemental investigations to identify other potential sanitary landfill sites were undertaken by the Broward County Office of Planning in June 1982. This review involved the identification of major undeveloped areas in the County by means of current aerial photographs. This resulted in the identification of 97 locations. These sites were then evaluated based upon the following criteria:

- Developed Area: Parcels that were clearly developed or being developed, based on evidence from observation, street maps and aerial photographs, were eliminated because it was assumed the cost of purchasing such areas would be prohibitive and would be strongly opposed by landowners and residents.

- Location: Parcels within the unincorporated area of the County were considered because it was assumed that the necessary land use plan amendments and zone changes could not be obtained in a municipality.

- Size: Parcels of approximately 300 acres within a section were the minimum considered. Smaller parcels were considered if their combination with parcels in adjacent sections would achieve the 300 acre threshold. The 300 acre minimum was used because it was assumed that smaller parcels would reduce the effective lifespan of a landfill operation.

- Development of Regional Impact: Active and approved D.R.I.s were excluded from consideration because it was assumed that acquisition costs would be prohibitive.

- Waterbodies: Parcels that included large waterbodies, such as abandoned rock pits, were eliminated, based on the assumption that filling the waterbodies would be impractical.

Sixteen possible sites (see Figure 3.1.2.1., Section 3.1.2, Site Selection) met the above criteria and were subjected to further evaluation by the Broward County Office of Planning, using the following criteria:

- Surrounding Existing Land Use: The type of land use and its density were considered for compatibility and possible neighborhood opposition.

- Surrounding Proposed Land Use: The land use type and density of any proposed projects or plats in progress were identified for compatibility.

- Existing Land Use on Site: The site land use type was examined for compatibility with and adaptability to a possible operation.

- Proposed Land Use on Site: Proposed uses were examined for compatibility and for present commitment.

- Access: Roads adjacent to, leading to, or cutting through the site, as well as proposed roadway corridors, were examined for compatibility, adequacy and possible neighborhood opposition.

- Environmental Sensitivity: Local Areas of Particular Concern (LAPC) and proposed Urban Wilderness Areas, both on and adjacent to the site, were identified to determine environmental compatibility.

- Ownership Pattern: The number of landowners, and the size of their parcels on the site were examined to find sites with approximately three owners or less.

- Jurisdiction by Other Agencies: Where it was known that agencies outside Broward County would have additional review or permitting powers (e.g., the FAA or the Army Corps of Engineers), they were noted.

Of the sixteen sites considered 9 were eliminated for reasons including LAPC status, size, parkland status and presence of development on-site. The 7 remaining sites were then further evaluated on the same level of detail as the sites previously investigated by Malcolm Pirnie, Inc.

Malcolm Pirnie supplemented the County evaluation of these seven sites by investigating several specific aspects of each site in addition to those evaluated by County staff.

Based upon the results of this study, it was concluded that only the Copans Road site should be considered for further evaluation along with the 441 site. By October 1982, the Broward County Commission made a firm policy decision not to rely on sanitary landfilling as the primary means of solid waste disposal, but rather to develop two full-service resource recovery projects.

On April 12, 1983 the County Commission approved the selection of the Copans Road and Route 441 site as locations for the proposed resource recovery facilities. On August 12, 1983 the Copans Road site, located in unincorporated Broward County, was rezoned by the County Commission from Limited Agricultural (A-1), Agricultural Utility (A-3) and General Industrial (M-3) to Planned Unit Development (PUD) for Special Complexes. By August 1984 the County had acquired all necessary property for the Copans Road site.

In May 1983, the Florida Legislature adopted House Bill 923 which annexed a portion of unincorporated Broward County into the City of Pompano Beach. Included within the area annexed was the 140 acre tract of land designated by the County as the proposed site for the North County resource recovery facility and ash residue/unprocessable waste landfill on Copans Road.

On September 1, 1983, House Bill 923 became effective annexing approximately three square miles of unincorporated Broward County, including the site on Copans Road designated for the North County resource recovery facility, into the City of Pompano Beach.

On October 12, 1983, the Pompano Beach City Commission directed the City planning and legal staff to institute the necessary procedures to rezone the Copans Road resource recovery facility and landfill property from the County designation of PUD for Special Complexes to the City designation of Highway Light Industrial (I-1). A resource recovery facility is not a permitted use or allowed as a special exception within the I-1 district. On March 6, 1984 the Pompano Beach City Commission unanimously voted on second reading to approve the ordinance rezoning the Copans Road I-1.

On April 5, 1984, Broward County filed its complaint for declaratory judgment, temporary and permanent injunction and other relief or, in the alternative, a petition for writ of certiorari. Pursuant to that petition, the Circuit Court judge issued an order to show cause, ordering the City of Pompano Beach to file their written response on or before May 1, 1984. The matter was set for hearing on May 31, 1984.

On April 30, the City of Pompano Beach filed a motion to dismiss the complaint for declaratory judgment, and temporary and permanent injunction and filed a motion to dismiss Broward County's petition for writ of certiorari. On May 15, 1984, Broward County filed a response to each of the City's motions to dismiss.

The hearing was held on May 31, 1984. At that time, the Court denied the City of Pompano Beach's motion to dismiss petition for writ of certiorari and heard Broward County's petition for writ of certiorari. On June 8, 1984 the judge issued a final judgment dismissing the action, stating that the County had not exhausted all the administrative remedies available to it through the City.

On July 9, 1984 the County filed a petition for a writ of certiorari with the District Court of Appeal, Fourth District of Florida requesting that the rezoning of the Copans Road Project site by Pompano Beach be voided and that the matter be remanded back to the Circuit Court so that the competing public interests could be balanced. This petition was denied by District Court on November 26, 1984.

On December 6, 1984 the County filed a motion for rehearing with the District Court which the Court denied on March 21, 1985. On July 1, 1985 the County filed an application for rezoning the Copans Road Project site from I-1 to Community Facilities (CF-1) and an application for a variance under I-1. If the City rezoned the Copans Road Project site from I-1 to CF zoning, the County would still be required to apply the City for a special use exception designation for this Project. The Pompano Beach Planning and Zoning Board unanimously denied the County's rezoning request on July 24, 1985. The County's variance request was scheduled to be heard on September 19, 1985.

In the meantime, Waste Management submitted an alternative proposal to the County in January 1984 as a part of the Company's overall proposal package by which the Company would locate a 2200 ton per day resource recovery facility at its Central Disposal Sanitary Landfill in unincorporated Broward County. On July 2, 1985 the Company was selected by the County Commission to be the full-service vendor for the North Broward County Resource Recovery Project. On August 13, 1985 the County Commission authorized staff to negotiate with Waste Management for the siting of the Project at the Hilton Road site. The County withdrew its Copans Road applications with the City of Pompano Beach in September, 1985 and filed a rezoning application for the Hilton Road site in February, 1986.

8.2 Proposed Site Design Alternatives

Presented below is a description of how the vendor, Waste Management, Inc., will provide the following facility systems while conforming to the RFP.

8.2.1 Cooling System (exclusive of intake and discharge

The following cooling system alternatives were examined.

1. Once through cooling using secondary treated wastewater.

2. cooling pond using York Lake.

3. Wet cooling tower.

   - York Pond for makeup
   - Groundwater as makeup
   - Wastewater treatment plant effluent as makeup

4. Dry cooling tower.

5. Dry condenser.

As discussed in Appendix 10.15, Options 1, 2 and 3 were evaluated based strictly on water availability and environmental permitting requirements resulting in the elimination of all except for the wet cooling tower using treated effluent for makeup. The wet cooling tower, the dry cooling tower and the dry condenser options were then optimized based on an economic comparison and compared on the basis of environmental impact. The wet cooling tower was evaluated at three different approach temperatures and three different condenser temperature rise values. An examination of the dry cooling tower and the dry condenser confirmed that the economic penalty for those options would be significantly greater than any of the wet cooling tower options.

The life cycle present worth penalty for the dry cooling tower and dry condenser are estimated to be $14 and $7.6 million, respectively compared to the best wet cooling tower option. In comparing the wet cooling tower options, there is very little difference in the evaporation or the makeup between them.

8.2.2 Biological Fouling Control

Biological fouling will be directly controlled by the periodic use of chlorine and biocide (inhibits biological growth) in the circulating water. Biological fouling will be indirectly controlled through the continual addition of inhibitor and dispersant (reduces corrosion and deposition which would have proivded breeding grounds for microorganisms) to the circulating water. Alum will be used to precipitate out phosphates (food stuff for microorganisms) in the cooling water makeup. Use of sulfuric acid, for pH control of the circulating water, will also indirectly help prevent biological fouling by keeping the pH of the water in a range where deposition is less likely to occur. Blowdown from the tower will be regulated to prevent buildup of precipitable chemicals that could serve as breeding grounds for microorganisms. Selection of a specific inhibitor, dispersant, or biocide has not been made at this time.

Blowdown from the cooling tower will not impact any water bodies or groundwater since it will be discharged directly to the Broward County North Regional Wastewater Tratment Plant. Selection of a biocide will be based on the chemical having a short toxic half-life so as not to detrimentally affect the County's treatment plant. All other chemicals to be used in the cooling tower will also be selected so as not to detrimentally affect the county's treatment plant as well.

No alternate is available that would have a lesser affect upon the environment.

8.2.3 Intake System

All intake water will be provided by pipeline from the Broward County Utilities Division. No other intake system is proposed.

8.2.4 Discharge System

All wastewater generated at the facility will be discharged to the county sewer for treatment at the Broward County North Regional Wastewater Treatment Plant. No other discharge system is proposed.

8.2.5 Chemical Waste Treatment

Blowdown from the boilers will be used for ash quench with any excess being discharged directly to the county sewer. Regeneration wastewaters from the boiler water makeup demineralizers will be neutralized prior to discharge to the county sewer for treatment at the Broward County North Regional Wastewater Treatment Plant.

Blowdown from the cooling tower will be discharged directly to the county sewer for treatment at the Broward County North Regional Wastewater Treatment Plant. Precipitation wastes from the cooling tower makeup water clarifier will be directly land filled.

As no other disposal methods are proposed, other methods of chemical waste treatment have not been developed.

8.2.6 Sanitary Waste System

All sanitary wastewaters will be discharged directly to the county sewer for treatment at the Broward County North Regional Wastewater Treatment Plant. No alternative disposal system is proposed.

8.2.7 Solid Waste Disposal System

8.2.7.1 Ash Wastes

The ash residue resulting from the incineration of solid waste has been used in parts of the United States and Europe as an aggregate for concrete, as well as a subbase material for roadway construction. This technology is still in the experimental stages. At present this type of application is not used in Florida. However, the possibility exists that after extensive study, the use of ash residue from incinerated solid waste as a construction material will prove to be environmentally benign. Ash residue used in this way would not only increase the life of the landfill associated with the resource recovery facility, but its sale would add revenue to the project.

8.2.7.2 Other Solid Wastes

The potential exists that unprocessables (i.e., white goods and construction debris) and recovered metals and glass can be recycled. However, this potential is dependent on a future market for such materials. At present, there are no plans for the recovering of these materials since the markets for their reuse are not sufficient to justify the additional costs associated with their recovery.

8.2.8 Multiple Uses

The facility as designed will process solid waste only. The technology utilized is specific to this application.

8.2.9 Other Systems

The facility has been designed to include state-of-the-art technology in order to provide maximum environmental protection.

SECTION 9
COORDINATION

Implementation of the resource recovery project has required coordination with numerous federal, state, regional, county and local government agencies. Information concerning the Project and its subelements has been obtained through correspondence, meetings and other forms of direct communication. Table 9.1 is a compilation of the agencies contacted for the development of this Project.

TABLE 9.1

COORDINATION DURING REZONING AND PREPARATION OF
POWER PLANT SITE CERTIFICATION APPLICATION

Agency	Contact	Title
	Federal	
U.S. Environmental Protection Agency Region IV Atlanta, Georgia	Winston A. Smith	Director, Air, Pesticides, and Toxics Management Division
	Bruce Miller	Acting Chief Air Programs Branch
	Michael Magee	Water Management Division
U.S. Department of Transportation Federal Aviation Administration	James E. Sheppard	Manager, Orlando Airport District Office
	State	
Florida Department of Environmental Regulation		
West Palm Beach District Office	Roy Duke	Regional Director
Divison of Archives, History and Records Mgt.	George W. Percy	Director
Florida Department of Land & Water Management	Paul Darst	Director
Power Plant Siting Section	Hamilton Oven	Power Plant Siting Section Administration
Power Plant Siting Section	Karen Anthony	Transmission Line Siting Coordinator
Bureau of Air Quality Management	Edward Palagyi	Engineer

MALCOLM PIRNIE

TABLE 9.1 (continued)

COORDINATION DURING REZONING AND PREPARATION OF POWER PLANT SITE CERTIFICATION APPLICATION

Agency	Contact	Title
	State (cont'd)	
Bureau of Air Quality Management	Larry George	Environmental Administrator
Bureau of Air Quality Management	Clair Fancy	Deputy Director Bureau of Air Qual. Mgmt.
Bureau of Air Quality Management	Edward Svec	Engineer
Office of General Counsel	Gary Early	Attorney (Tallahassee)
Bureau of Air Quality Management	Steven G. Conn	Permitting
Public Service Commission	Carrie Hightman	Staff Counsel
	Robert Trapp	Engineer
State of Florida Planning and Develo-opment Clearinghouse	Richard Smith	Federal Consistency Coordinator
	Local	
Broward County:		
Environmental Quality Control Board, Broward County	Vic Howard	Pollution Control Officer
	John Chase	Groundwater Quality Monitoring Specialist
	Fran Henderson	Water Quality Investigator
Office of Planning Broward County	Don Kowell	Director, Office of Planning
	Roy Groves	Director, Plan Implementa-tion Division
	Al Shamoun	Associate Planner

TABLE 9.1 (continued)

COORDINATION DURING REZONING AND PREPARATION OF
POWER PLANT SITE CERTIFICATION APPLICATION

Agency	Contact	Title
	Local (cont'd)	
Intergovernmental Affairs	Eugenie Suter	Director
Engineering Division	Henry P. Cook	Director
Planning Council	Susan K. Philp	Director, Comprehensive Planning
Utilities Division	Ed Goscicki	Director
Parks and Recreation Division	Larry Lietzke	Director
Property Division	Frank Frey, Jr.	Director
General Counsel Office	Susan F. Delegal Annette Star Lustgarten	General Counsel Deputy General Counsel
Finance and Administrative Services Department	Foster Muzea	Director
Offices of Budget and Mgmt.	John Canada	Director
Florida Power & Light Company:	Douglas P. Macke	Administrator of Governmental Services
	Duane Bateman	Right-of-Way Representative
	Robert H. Stevens Delia Perez	Distribution Engineering Dept.
Broward League of Cities:	Walter Falck	Executive Director
Resource Recovery Project Selection/ Negotiation Committee	Dick Marant	Former City Manager, City of Dania

MALCOLM PIRNIE

TABLE 9.1 (continued)

COORDINATION DURING REZONING AND PREPARATION OF POWER PLANT SITE CERTIFICATION APPLICATION

Agency	Contact	Title
	Local (cont'd)	
Resource Recovery Project Selection/ Negotation Committee (cont'd)	F.T. Johnson	Broward County Administrator
	Ray M. Carson	Director, Broward County Public Work Dept.
	Milan Knor	Engineer, City of Miramar
	Robert Cox	City of Ft. Lauderdale Commissioner
	Alan Roberts	Director, City of Ft. Lauderdale Uilities Department
	Taylor P. Calhoun	Former Director, City of Hollywood Utilities Department
	Thomas Flynn	City of Pompano Beach Commissioner
	Scott I. Cowan	Broward County Commissioner
	Nicki Grossman	Broward County Commissioner
	Howard Forman	Broward County Commissioner
	Thomas M. Henderson	Resource Recovery Project Director
Broward County Economic Development Council	Skeet Jernigan	Director
City of Pompano Beach		City Commission City Manager Public Works Director Planning Office Director

MALCOLM PIRNIE

TABLE 9.1 (continued)

COORDINATION DURING REZONING AND PREPARATION OF POWER PLANT SITE CERTIFICATION APPLICATION

Agency	Contact	Title
	Local (cont'd)	
City of Coconut Creek		City Commission City Manager City Engineer
City of Margate		City Manager
City of Lighthouse Point		City Manager
City of Parkland		City Manager
City of Coral Springs		City Manager
City of Hillsboro		City Manager
City of Deerfield Beach		City Manager
City of Tampa	Joe Murdoch	Environmental Specialist MacKay Bay Resource Recovery Project
Hillsborough County	Marc J. Rogoff, Ph.D	Director, Resource Recovery
Pinellas County	W.W. Dasker	Director, Public Works Operation County Commissioners Executive
Palm Beach County	Tim Hunt	Director, Solid Waste Authority

MALCOLM PIRNIE

SECTION 10

APPENDICES

Appendices 10.1 through 10.17 are included as part of this submittal in a separate volume. Volume II contains Appendices 10.1 through 10.17.

SECTION 11

REFERENCES

Broward County Planning Council; "Broward County Land Use Plan". Adopted by Board of County Commissioners, 1977.

Broward County Planning and Administrative Systems Division. "Unincorporated Area Land Use Plan". Adopted by Board of County Commissioners, 1979; Amended 1980.

Broward County Planning and Administrative Systems Division; "The Housing Element of the Broward County Comprehensive Plan", 1979.

Broward County Office of Planning; "Parks, Recreation and Open Space Element of the Broward County Comprehensive Plan", 1982.

Broward County Office of Planning; "The Economic Element of Broward County Comprehensive Plan", 1983.

Broward County Office of Planning; "Broward County Comprehensive Plan Utility Element", 1981.

Broward County Office of Planning; "Broward County Statistical Summary" 1983.

Broward County Office of Planning; "The Coastal Zone Protection/Conservation Element of the Broward County Comprehensive Plan", 1981.

Broward County, "Coastal Zone Protection Conservation Element of the Broward County Comprehensive Plan", March 1981.

Broward County; "Broward County Environmental Quality Control Board Annual Report", 1982/1983.

Broward County; "Broward County Land Use Plan Board of County Commissioners", 1977.

Broward County; "Unincorporated Area Land Use Plan, Board of County Commissioners". Adopted September 4, 1979.

Camp Dresser & McKee; "Evaluation of Present and Potential Groundwater Contamination at the Central Disposal Sanitary Landfill, Broward County, Florida," 1982.

Cartographic Section of the Planning and Administrative Systems Division of Broward County; "Broward County Metropolitan Area Map Atlas", 1980.

Cartographic Section of the Planning and Administrative Systems Division of Broward County "Broward County Metropolitan Area Map Atlas", 1985.

City of Boca Raton; "Statistical Abstract", 1981; Revised April 1985.

City of Boca Raton; Department of Community Development; "Population Estimates and Projections for Greater Boca Raton", February 1980.

Entek Research, Inc.; "Estimate of FPL PURPA Purchase Rates and Review of Florida PSC PURPA Rules", July 1983.

Food and Resource Economics Department, IFAS, University of Florida, Gainesville, 1979. Port Everglades: An Energy and Economic Assessment", 1979.

Law Engineering Testing Company; "Report of Geotechnical Investigation, Broward County North District Wastewater Treatment Solid Residuals Disposal Facility", 1980.

Malcolm Pirnie, Inc.,; "Request for Proposals, Full Service Solid Waste Disposal", Broward County, September 1983.

Malcolm Pirnie, Inc.; "The Generic Overview of Solid Waste Management Alternatives", Broward County, February 1982.

Malcolm Pirnie, Inc.; "Site Evaluation for Solid Waste Management Alternatives", Broward County, February 1982.

Malcolm Pirnie, Inc.; "Request for Proposals, Full Service Solid Waste Disposal", September 1984.

Malcolm Pirnie, Inc.; Engineering Report, "Evaluation of Contractor Qualifications", Broward County, March 1983.

Malcolm Pirnie, Inc.; "Engineers Project Status Report", Broward County, November 1984.

Malcolm Pirnie, Inc.; "Technical Evaluation of Vendor Proposals", February 1985.

Palm Beach County Department of Planning, Zoning & Building; "Comprehensive Plan", 1980.

Palm Beach County, "Maps, Graphs & Data Book of Palm Beach County", 1985.

Parker, Garald G., G.E. Ferguson, S.R. Love; "Water Resources of Southeastern Florida". Geological Survey Water-Supply Paper 1255, United States Government Printing Office, Washington, 1955.

Pendleton, Robert F., H.D. Dollar, L. Law, Jr.; "Soil Survey of Broward County Area, Florida". United States Department of Agriculture, Soil Conservation Service and University of Florida, 1976.

Plan Implementation Division, Broward County Office of Planning; "The Solid Waste Subelement of the Broward County Comprehensive Plan", 1982.

Ross, Saarinen, Bolton and Wilder, Inc.; North Region Wastewater System Solid Residuals Disposal Phase I Design". Camp, Dresser and McKee, Inc., Fort Lauderdale, 1980.

Ross, Sarrinen, Bolton and Wilder, Inc.; "Dixie Well Field Stress Analysis, City of Fort Lauderdale, Florida". Camp, Dresser and McKee, Inc., Fort Lauderdale, 1980.

Sherwood, C.B., H.J. McCoy, C.F. Galliher; "Water Resources of Broward County, Florida". Report of Investigation Number 65, United States Geological Survey, Tallahassee, 1973.

Vorhis, R.C.; "Geology and Ground Water of the Fort Lauderdale Area, Florida". Florida Geological Survey Report Investigation 6, 1948.