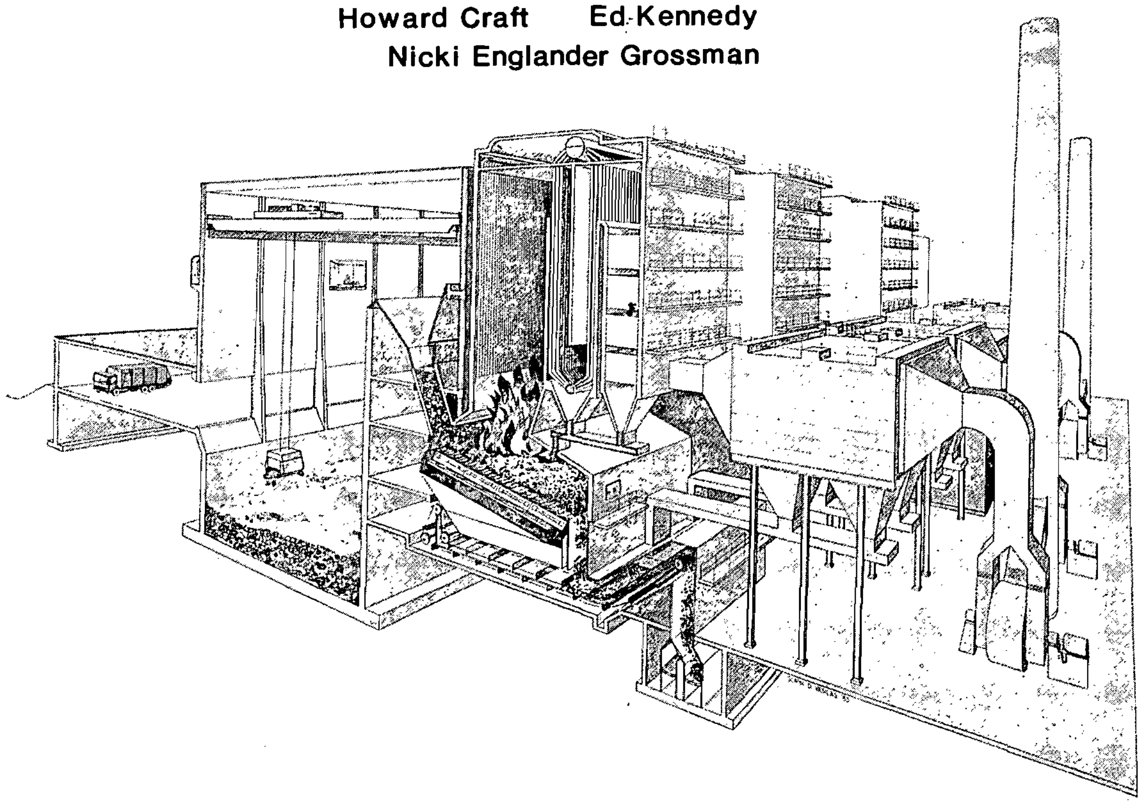
South Broward County Resource Recovery Project, Inc.

Solid Waste Energy Recovery Facility Application for Power Plant Site Certification

Volume I - Route 441 - Technical Submittal

Submitted By
The Broward County
Board of County Commissioners

Scott I. Cowan, Chairman
Gerald Thompson, Vice Chairman
Marcia Beach
Howard Forman
Howard Craft
Ed Kennedy
Nicki Englander Grossman



Floyd T. Johnson, County Administrator
Thomas M. Henderson, Director, Resource Recovery Office

March 1985

MALCOLM PIRNIE

BROWARD COUNTY • FLORIDA

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices And/Or To Other Than The Addressee		
To: Tom Rogers	Loctn.: BAQM	
To:	Loctn.:	
To:	Loctn.:	
From:	Date:	
Reply Optional [ ]	Reply Required [ ]	Info. Only [ ]
Date Due:	Date Due:	

TO: Power Plant Siting Review Committee

FROM: Hamilton S. Oven, Jr., P.E. KWA for

DATE: April 8, 1985

SUBJECT: South Broward County Resource Recovery Project
Power Plant Siting Application PA 85-21

Please review the attached power plant siting application from Broward County for completeness (as opposed to sufficiency) and provide me your comments by the morning of April 17, 1985. There will be a meeting of the Siting Review Committee to discuss the application at 1:30 on April 17, 1985, in Room 518 (Division of Permitting Director's Conference Room).

HSOjr/sb

Attachment

Distribution:
- Tom Rogers, BAQM (1 copy + 1 extra)
- Ed Svec, BAQM (1 copy)
- Don Kell, Groundwater (1 copy)
- John Reese, Solid Waste (1 copy)
- Larry Olsen, Biology (1 copy)
- Joe Lurix, South Florida District (3 copies)
- Julie Cobb, O/General Counsel (1 copy)
- Janet Llewellyn, Standard Form Permitting (1 copy)
- George Baragona, Engineering Support (1 copy)

(12)

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

APPLICATION FOR POWER PLANT SITE CERTIFICATION - ROUTE 441 SITE

Submitted By

The Broward County Board of County Commissioners

March 1985

BROWARD COUNTY • FLORIDA

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

March 29, 1985

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
South Broward County Resource Recovery Project, Inc.

Gentlemen:

On behalf of the Broward County Board of County Commissioners, an application for certification under Chapter 17-17 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 17-17. This application has been prepared in accordance with the intent of the Power Plant Siting Act as set forth in Section 403 Florida Statutes, the requirements of the Electrical Power Plant Siting Regulations as set forth in Florida Administrative Code Rule 17-17, 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 applicant for this certification (the South Broward County Resource Recovery Project, Inc.), as owner and operator of the referenced project, constitutes a legal corporation in the State of Florida duly established by the authority of the Broward County Board of County Commissioners. Certain rights and obligations of said corporation may be transferred, at a future date, to a full-service vendor selected to enter into a long-term contractual service agreement with Broward County.

As you are aware, the subject application addresses both the resource recovery facility and the unprocessable waste/ash residue landfill components of the referenced project. Both facilities are to be located at the site proposed and described by the application and together constitute the subject of the Certification herein requested.

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. Indeed, 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 maintain the current standard-of-living and well-being of the County citizenry.

Over the past year, several significant accomplishments have marked efforts to implement the proposed resource recovery program and realize the above-stated objective. Firstly, as reflected in the special study report "Compilation of Information-Route 441 Zoning and Land Use" submitted in conjunction with the subject application in conformance with FAC Rule 17-17.121(3)(1), diligent efforts by Broward County have successfully secured legal control of the site for the referenced project and have achieved appropriate zoning and land use classifications for same. Secondly, Broward County has recently received proposals from two full-service vendors (Signal RESCO, Inc. and the American Ref-Fuel Company) competing for the right to enter into a long-term contract with the County for the design, construction and operation of the referenced project. Certain information from these vendor proposals has been incorporated into the subject application; review of the proposals is currently being undertaken by Broward County. Thirdly, the County has recently secured financing for the proposed program through the issuance of Industrial Development Bonds which, with a total bond issue in excess of 500 million dollars, represents the largest bond issue undertaken to date in the United States for a single resource recovery program. Finally, Broward County has received certain key regulatory agency approvals necessary to construct the referenced project at the proposed site.

Regulatory approvals obtained to date for the referenced project are particularly germane to the subject application. On February 6, 1984 the County received approval from the U.S. Department of Transportation, Federal Aviation Administration to construct the referenced project at the proposed site (see Appendix 10.1.6 of the subject application). With respect to dredge and fill activities necessary to construct the referenced project at the proposed site, the U.S. Department of Defense, Army Corps of Engineers issued a letter to the County on July 13, 1984 stating its intent to grant the required permit under Section 404 of the Clean Water Act upon issuance of a Water Quality Certification by the State of Florida pursuant to Section 401 of the Clean Water Act. On September 14, 1984 the County received notice of Intent to Issue from the Florida Department of Environmental Regulation concerning the required State dredge and fill permit and associated Water Quality Certification. We understand that further action by the State toward issuing those permits will be encompased by final approval under the Power Plant Site Certification process for which the present application is transmitted this date. While we understand such action is necessary to comply with Section 403 Florida Statutes and rules promulgated thereunder, we trust that further detailed review of this aspect of the project will not be necessary since the present scope and magnitude of proposed dredge and fill activities (as well as the mitigation plan already approved by the agency) remain unchanged from that which has already been found acceptable to the agency and upon which the referenced notice of Intent to Issue was based. In this regard, we wish to note that Broward County has invested considerable resources evaluating potential impacts of the proposed program on air, water and land resources and in obtaining regulatory approval for dredge and fill activities required for the referenced project, including the expenditure of over 7 million dollars to date in support of the mitigation program which has been reviewed and found acceptable by both the U.S. Army Corps of Engineers and the Florida Department of Environmental Regulation. Correspondence pertaining to the required dredge and fill permits has been incorporated into the subject application (see Appendix 10.1.4 relative to the U.S. Army Corps of Engineers permit and Appendix 10.4 relative to the Florida Department of Environmental Regulation permit).

In addition to the above, we wish to advise that several other permit applications for the referenced project were individually submitted to the appropriate Bureaus and Divisions of the Department of Environmental Regulation in the recent past. These submittals were based on a lower projected throughput capacity for the referenced project with an associated standing electrical generating capacity of less than 50 megawatts. Because the projected capacity, as reflected in the present application, has since been increased resulting in greater than 50 megawatt standing electric generating capacity, it is now necessary to seek certification under the Power Plant Siting Act through which such required permit program approvals will be consolidated. While those permit applications previously submitted (with the exception of the State dredge and fill permit noted above) have not been formally acted upon to date, much basic information contained therein remains applicable to the referenced project. Therefore, we are hopeful that the familiarity gained by the Department through its previous review of the referenced project will, at a minimum, result in a timely and expeditious review of same under the Electrical Power Plant Site Certification process.

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 reliance on landfill practices for disposal of the total County 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 mid-1988, dictates that construction commence on the proposed site by the end of 1985. Your cooperation and assistance toward realization of this goal will be sincerely appreciated.

Very truly yours,

Thomas M. Henderson

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

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

POWER PLANT SITE CERTIFICATION APPLICATION
ROUTE 441 SITE

SUBMITTED BY

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

MARCH 1985

Stephen C Schwarz

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

MALCOLM PIRNIE

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. 0041151

	DATE	CHECK NO.	AMOUNT
PAY EXACTLY*****25,000**DOLLARS AND [illegible]NTS	03/18/85	41151	*****25,000.00*

TO THE ORDER OF

STATE OF FLORIDA
DEPT OF ENVIRON REG
2600 BLAIR STONE RD
TALLAHASSEE FLA 32301

VOID AFTER (90) NINETY DAYS

CHAIRMAN BOARD OF COUNTY COMMISSIONERS

AUTHORIZED SIGNATURE

⑈041151⑈ ⑆067006076⑆ 4170024449⑈

Revised May 1, 1985

SOUTH 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:	South 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: 4400 South State Road 7 Ft. Lauderdale, Florida 33301 (Unincorporated Area) Latitude: 26° 04' 07" N Longitude: 80° 12' 19" W UTM Zone: 17 UTM x coordinate: 579.54 km UTM y coordinate: 2883.34 km Township and Range: T50~~5~~S, R41E, Sections 24 and 25 T50~~5~~S, R42E, Sections 19 and 30
Location of Any Directly Associated Transmission Facilities:	Florida Power and Light Company (across canal to east from Project Site)

MALCOLM PIRNIE

SOUTH 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:	68.5 megawatts
Ultimate Generating Capacity for Certification	96.1 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 50,000 homes annually.

BROWARD COUNTY, FLORIDA
SOLID WASTE ENERGY RECOVERY FACILITY
APPLICATION FOR POWER PLANT SITE CERTIFICATION

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LIST OF PLATES

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FIGURES (continued)

MALCOLM PIRNIE

FIGURES (continued)

ABBREVIATIONS AND ACRONYMS

AADT	-	Average annual daily traffic
AAQS	-	Ambient air quality standard
ADT	-	Average daily traffic
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
CEC	-	Cation exchange capacity
CO	-	Carbon Monoxide
CUPS	-	Consumptive Use Permits
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
FIRM	-	Flood Insurance Rate Map
FLUCCS	-	Florida Land Use and Cover Classification System
FML	-	Flexible membrane liners
FP&L	-	Florida Power and Light Company
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
JTU	-	Jackson Turbidity Units

ABBREVIATIONS AND ACRONYMS (continued)

kips	-	Kilopounds (1000 pounds)
km	-	Kilometers
kv	-	Kilovolt
kw	-	Kilowatt
LAER	-	Lowest Available Emission Rate
Ldn	-	Day-Night Energy Equivalent Noise Level
Leq	-	Energy Equivalent Noise Level
LOS	-	Level Of Service
M^3	-	Cubic meter
MCL	-	Maximum Contaminant Level
mgd	-	Million gallons per day
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
NWI	-	National Wetlands Inventory
NWS	-	National Weather Service
NO_2	-	Nitrogen Dioxide
PFU	-	Plaque Forming Units
ppm	-	parts per million
PSC	-	Public Service Commission
PSD	-	Prevention of Significant Deterioration
psi	-	pounds per square inch
P.U.D.	-	Planned Unit Development
PURPA	-	Public Utility Regulatory Policies Act
PVC	-	Polyvinyl Chloride
RCRA	-	Resource Conservation & Recovery Act
RFP	-	Requests for Proposals
SCS	-	Soil Conservation Service
SELS	-	Severe Local Storms
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

ABBREVIATIONS AND ACRONYMS (continued)

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
WWTP	-	Wastewater Treatment Plant

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 South 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 Southern Broward County. Noncombustibles and inert ash residue resulting from the plant's combustion process will be landfilled at an ash residue/unprocessable landfill located on the Project site. 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 will help offset the overall cost of the Project. The County will contract with a full-service vendor to design, construct, and operate the Project for 20 years with two renewal option periods totaling fifteen years. The County will lease the land to the vendor. The vendor will own the plant.

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 best alternative for Broward County in achieving these goals is through a solid waste-fired electrical power plant.

Site Location

Pursuant to Section 403.50~~5~~6, Florida Statutes, Broward County is applying for certification for a solid waste-fired electrical power plant on a 248 acre tract in unincorporated Broward County at the southeast quadrant of the intersection of U.S. Route 441 and State Road 84. The facility site is located directly across the South Fork New River Canal from a Florida Power and Light Company power plant. The Project site is located near the solid waste centroid for Southern Broward County.

Facility Description

The Project will be a mass-burn resource recovery facility with an initial continuous design rated capacity of 2352 tons per day of solid waste and a gross electrical generating capacity of approximately 68.5 megawatts. In anticipation of future disposal needs, Broward County is seeking certification for ultimate site electrical generating capacity of approximately 96.1 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), F.A.C. (Instruction Guide for Certification Applications: Electrical Power Plant Site, Associated Facilities, and Associated Transmission Lines).

This application consists of three (3) 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 10.8 of the application.

Volume III (Appendices) - contains Section 10, Appendices 10.9 through 10.18 of the application.

As required by Rule 17-17.121 (3) (a), F.A.C. three (3) copies of materials which show the procedures taken to accomplish compliance of the site with existing land use plans and zoning ordinances is included as well. This compilation of information is referred to as the "Compliance Document".

Principle 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. In the case of the Mitigation Plan, the Project will actually enhance and preserve natural wetland habitat. The analysis presented in this application supports these findings and is summarized as follows:

- 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 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 - A series of advertised formal public hearings have been conducted concerning site rezoning. At those hearings, public input, testimony, and documents were entered into the record as land use and zoning issues were evaluated. As noted in Section 2.2.2, the Broward County Development Review Committee, Broward County Zoning Board, Broward County Office of Planning and Planning Council and the Broward County Board of County

Commissioners each concluded that the proposed solid waste energy recovery project is consistent with all portions of the Broward County Comprehensive Plan; and compatible and in compliance with land use and zoning patterns in the area. Accordingly, the Board of County Commissioners rezoned the project site to Planned Unit Development for Special Complexes on March 16, 1984 to ensure orderly development in strict compliance with local, state and federal regulations.

- 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.

- Traffic - As discussed in Section 5.9, the solid waste energy recovery facility will increase daily traffic by approximately one percent on Route 441 and less than one percent on State Road 84. The analysis shows that there will be no capacity problems with this additional traffic.

- Surface Water and Groundwater - As discussed in Section 4.2 and 4.3, all plant process water will be drawn from municipal or county supply facilities and all wastewater will go to the Hollywood Wastewater Treatment Plant. Potable water will be used in small quantities in the personnel areas of the 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.

- 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.

- 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. While the site and adjacent areas provide habitats for a variety of terrestrial and aquatic organisms, none of these habitats are considered critical and therefore, it is not anticipated that the proposed project will have any significant effects on area ecology.

- Aesthetics - As discussed in Section 3.2.2, there will be a visual height impact associated with the facility. The facility will be designed to be aesthetically pleasing and architecturally compatible with the surrounding area.

- 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 full-service vendor procurement process for the Project is in progress with selection of a vendor expected by June 1985. The selected vendor will be required through a contract with the County to guarantee compliance with all terms and conditions of the Site Certification and Development Order conditions.

Construction is scheduled to begin in January 1986. The projected in-service date for the facility is July 1, 1988. The projected capital cost for the initial project development is approximately $266 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 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.

The County has acquired all parcels necessary for the Project including mitigation lands and is in the process of finalizing an Interlocal Agreement for Solid Waste Disposal Service (ILA) with the County's twenty-eight municipalities.

SECTION 1

NEED FOR POWER AND THE PROPOSED FACILITY

1.1 Overview

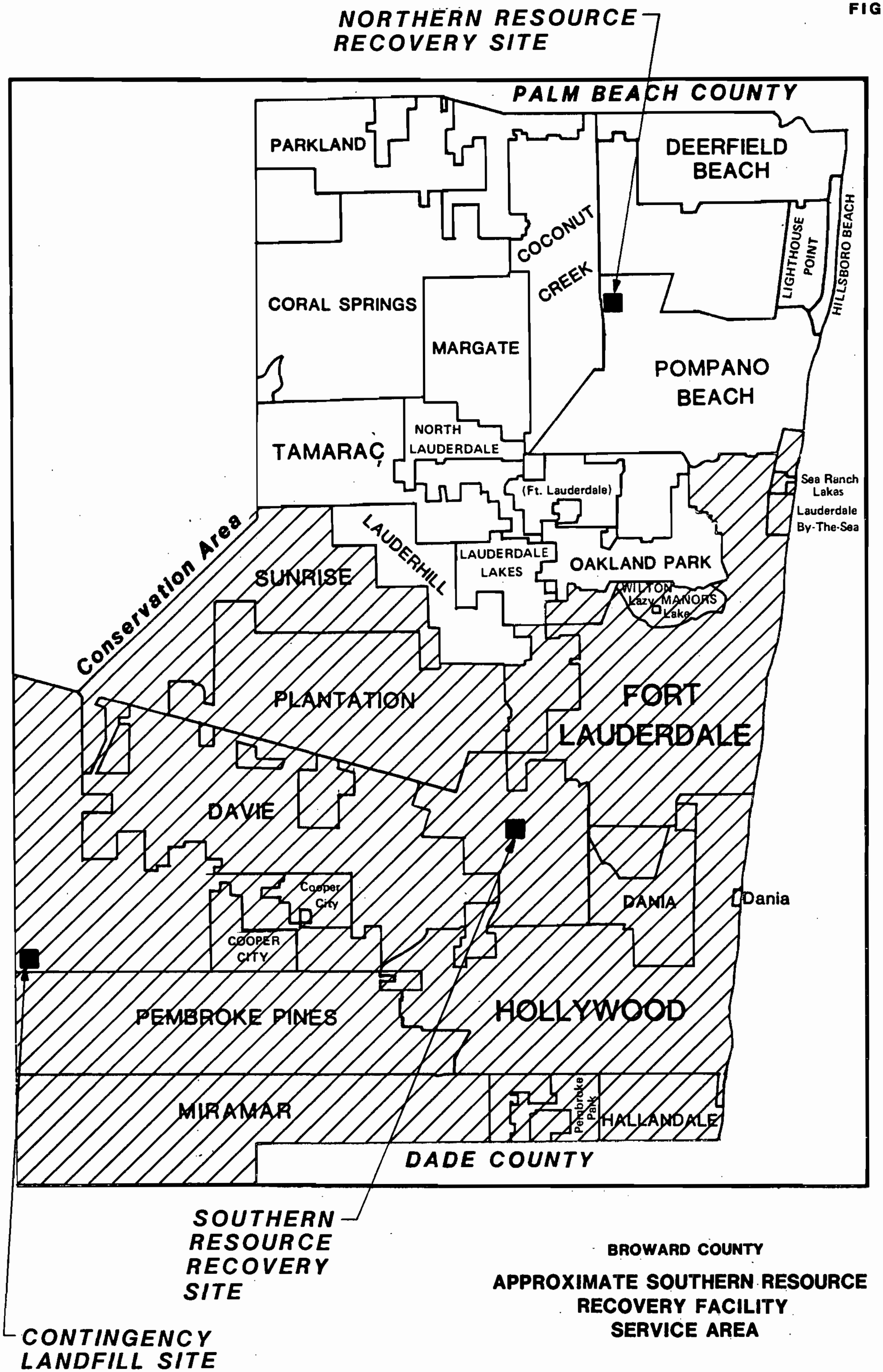
The Broward County Resource Recovery System has been selected as the best alternative for meeting Broward County's long-term solid waste disposal needs. This system will:

- dispose of garbage and trash in an environmentally sound manner;
- reduce the need for siting and developing a raw garbage landfill;
- recover energy by using solid waste as a fuel to produce electricity and;
- create new opportunities for recreation and wetland habitat enhancement through extensive mitigation.

Broward County is proposing to develop as initial parts of the system two mass-burning resource recovery facilities, attendant landfills, and a contingency landfill site (see Figure 1.1.1). The proposed southern facility, which is the subject of this Application, will be located on a 248 acre tract in unincorporated Broward County at the southeast quadrant of the intersection of U.S. Route 441 and State Road 84.

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 Counties. The estimated 1983 population of the County was 1.1 million persons.



BROWARD COUNTY

APPROXIMATE SOUTHERN RESOURCE RECOVERY FACILITY SERVICE AREA

Nearly 1.2 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 deemphasizing 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 South Broward County Resource Recovery Project

The proposed South Broward County Resource Recovery Facility will be designed to initially generate approximately 68.5 megawatts of electrical power using solid waste generated predominantly in the southern 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 96.1 megawatts.

A petition was filed with the Florida Public Service Commission on March 13, 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.

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, <u>maximum recycling and reuse of such resources must be considered goals of the State</u>." (emphasis added)

Last year the Florida Legislature acting to "protect the health, prosperity, and general welfare... of its citizen's" declared Chapter 84-198, 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 <u>environmentally preferred alternative to conventional solid waste disposal</u>" for the State of Florida (emphasis added).

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 economically feasible solution to the County's long-term disposal needs.

1.5 Consistency of Project with the State Plan Goals and Policies

The South Broward County Resource Recovery Project is consistent with the following State Plan goals.

The Project will:

- o help maintain the overall level of water quality in surface and underground systems that have not been degraded by reducing the need to rely on sanitary landfills (State Plan, p. 15);
- o offset losses in wetlands by protecting and restoring the ecological functions of wetlands systems to ensure their long-term environmental, economic and recreational value (State Plan, p. 18, Policy NE 29, p. 20); and
- o assist in reducing per capital energy consumption by reducing the need for new power plants by using solid waste as fuel to recover energy, (State Plan p. 22, Policy NE 44).

As stated in the State Plan on page 23, "The scarcity of disposal sites, together with the possibility of recycling valuable materials and generating energy, is leading to increased emphasis on resource recovery. Several Florida communities already have taken the lead with resource recovery facilities".

SECTION 2

SITE AND VICINITY CHARACTERIZATION

2.1 Site and Associated Facilities Delineation

Drawing No. 10575C, Plate 1 - Sketch of Description of the Route 441 Site provides the current dimensions and legal description of the proposed site. The Project site consists of 248 acres.

As illustrated, the project site is located at the southeast intersection of U.S. Route 441 (State Road 7) and State Road 84. The southern and eastern site boundaries are formed by the South Fork New River Canal. Figure 2.1.1 illustrates the conceptual development and environmental enhancement plan for the Project site and adjacent property uses. Located to the east of the site is Florida Power & Light (FP&L). FP&L's property and associated facilities, including cooling ponds, border the entire length of the east bank of the South Fork New River across from the Project site. An aerial photograph of the site and adjacent land uses is provided on the following page.

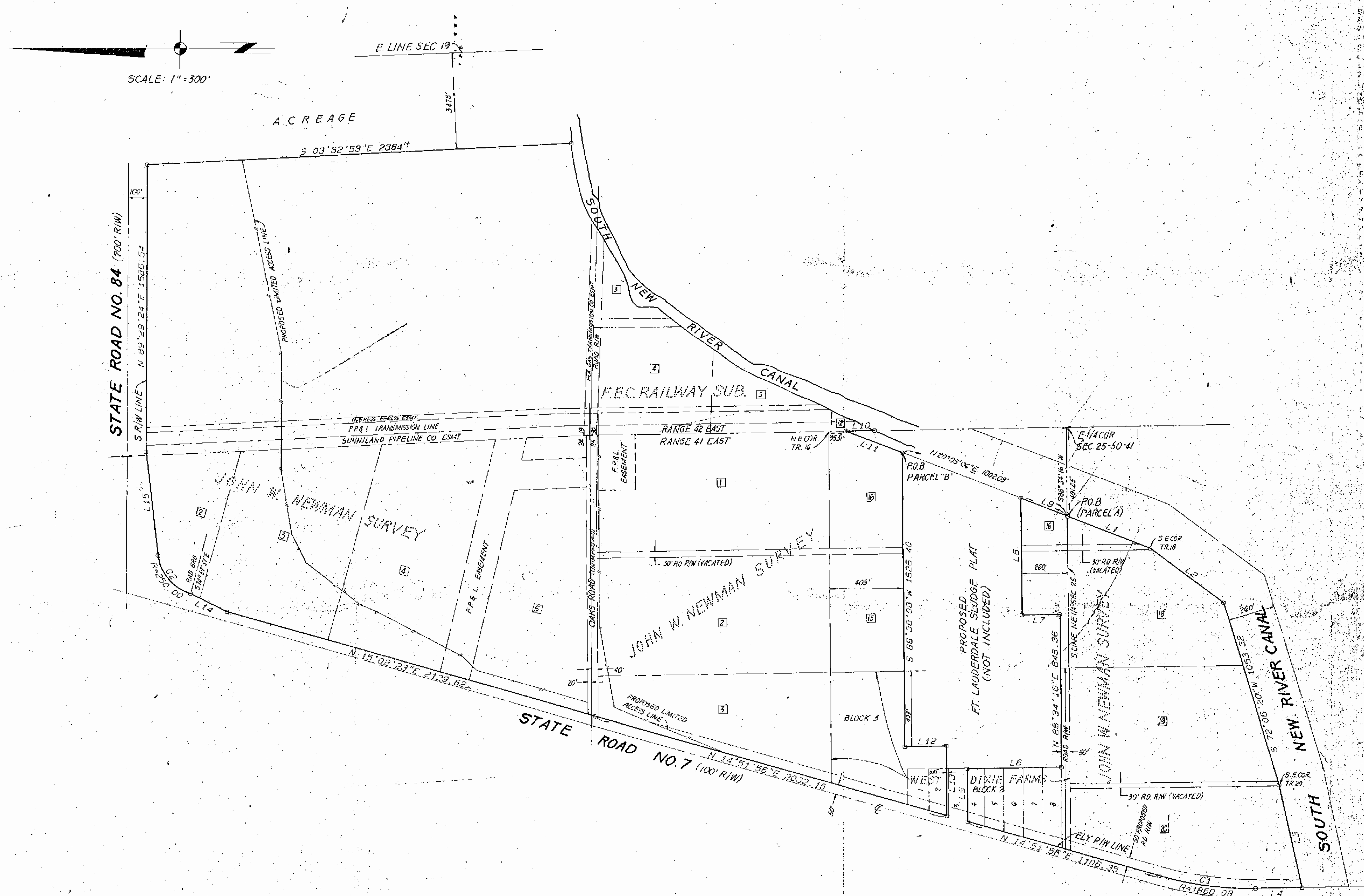
The development of the site will consist of the resource recovery facility in the southern quadrant, and landfill cell development in the middle and northern quadrants. Two independent landfill cells will comprise the landfill development plan. The cells will be divided by a buffer zone presently underlined by FP&L easement.

The conceptual development plan was prepared in recognition of the following constraints:

- An 130 acre pond apple slough area owned by the Department of Natural Resources for I-595 mitigation adjacent to the northeastern portion of the site.

- A sludge composting facility owned by the City of Fort Lauderdale will occupy approximately 30 acres between the landfill and the facility. This facility has been under construction since January, 1985.

(1) PLATE 1
0112119-AC



LINE	BEARING	DISTANCE	
1	S 20°05'06"W	492.28	
2	S 35°44'42"W	508.13	
3	S 76°30'24"W	580.87	
4	N 01°51'23"W	259.23	
5	N 88°34'16"E	291.76	
6	S 01°42'40"E	524.08	
7	N 01°42'40"W	210.00	
8	N 88°34'16"E	648.41	
9	S 20°05'06"W	279.47	
10	N 01°46'20"W	161.16	
11	S 20°05'06"W	337.03	
12	S 01°42'50"E	229.64	
13	S 88°34'16"W	385.00	
14	N 25°57'47"E	227.77	
15	N 82°30'21"E	576.89	
CURVE	DELTA	RADIUS	ARC
1	16°43'20"	1860.08	542.88
2	67°27'58"	250.00	294.38

No.	DATE	ISSUED FOR	BY
1	12-8-83	SOLID WASTE PERMIT	P.E.R.

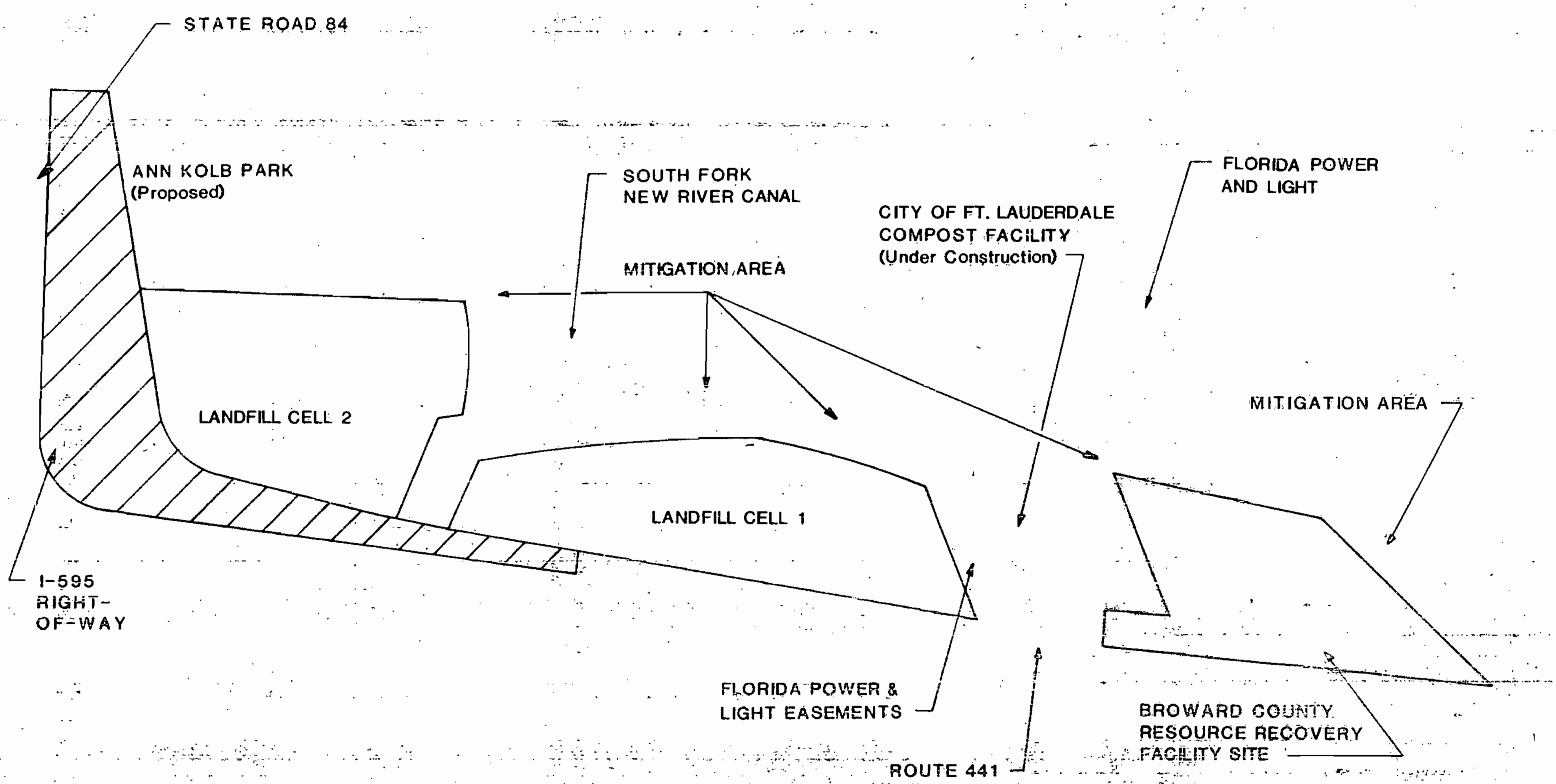
SKETCH OF DESCRIPTION
OF THE PROPOSED
STATE ROAD NO. 7 LANDFILL SITE

BROWARD COUNTY FLORIDA

REVISIONS

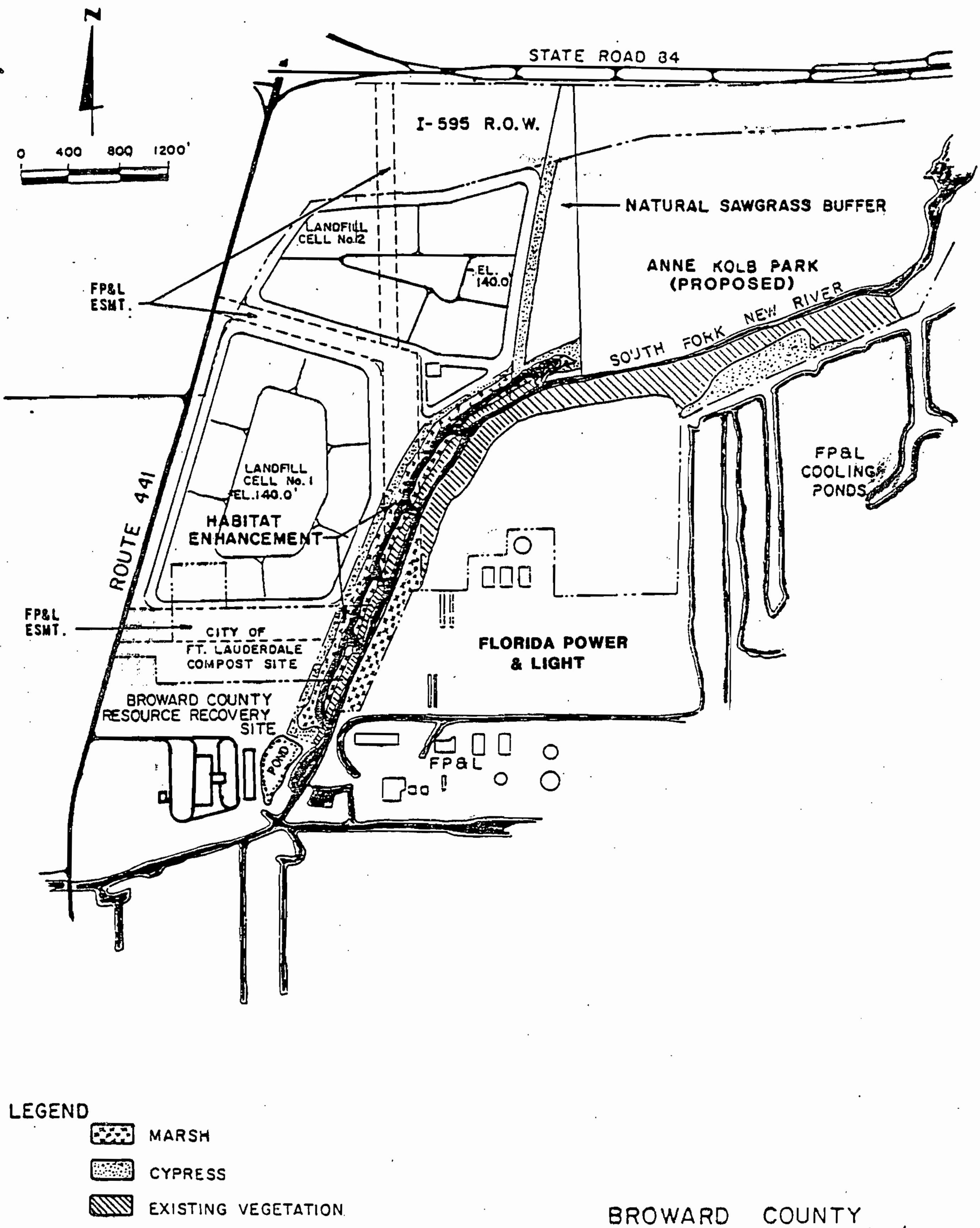
KEITH AND SCHNARS, P.A.
ENGINEERS - PLANNERS - SURVEYORS
FT. LAUDERDALE, FL. (305)763-3843
GAINESVILLE, FL. (904)372-3301
DEERFIELD BEACH, FL. (305)421-0282
OCALA, FL. (904)629-7182

DATE 6/15/83
SCALE 1" = 300'
FIELD BOOK N.A.
DWN. BY K.H.
CKD. BY [illegible]
SHEET NO. 1 OF 1
DWG. NO. 10575C


STATE ROAD 84
ANN KOLB PARK
(Proposed)
SOUTH FORK
NEW RIVER CANAL
FLORIDA POWER
AND LIGHT
CITY OF FT. LAUDERDALE
COMPOST FACILITY
(Under Construction)
MITIGATION AREA
LANDFILL CELL 2
MITIGATION AREA
LANDFILL CELL 1
I-595
RIGHT-
OF-WAY
FLORIDA POWER &
LIGHT EASEMENTS
BROWARD COUNTY
RESOURCE RECOVERY
FACILITY SITE
ROUTE 441

1983

FIGURE 2.1.1



BROWARD COUNTY
RESOURCE RECOVERY
CONCEPTUAL DEVELOPMENT AND
ENVIRONMENTAL ENHANCEMENT PLAN
FOR THE ROUTE 441 SITE
NOT TO SCALE

Burch Air Photo Service, Inc

- o Approximately 20 acres in the northern portion of the site are reserved for Interstate 595 (under construction).

- o Existing Florida Power & Light powerline easements.

A plan has been developed in coordination with FDOT (see Appendix 10.3) and the City of Fort Lauderdale such that none of the above proposed uses will either be affected or have an effect on the proposed resource recovery development. Details of site utilization for both the resource recovery facility and ash residue/unprocessable waste landfill are contained in Figures 2.1.2 and 2.1.3, respectively.

Resource Recovery Facility

Figure 2.1.2, illustrates a general development plan for the resource recovery facility as proposed by American Ref--Fuel. American Ref-Fuel is one of three vendors prequalified by the County in 1983 for this Project. The other two prequalified vendors are Waste Management, Inc. and Signal RESCO, Inc. This figure is reflective of the type of development that will occur. This plan does not indicate a preference for a particular vendor's system, and it may be revised depending upon eventual vendor selection.

The facility will be bounded by Route 441 to the west; by the South Fork New River Canal to the east and south; and by a composting facility for the City of Fort Lauderdale (under construction) to the north.

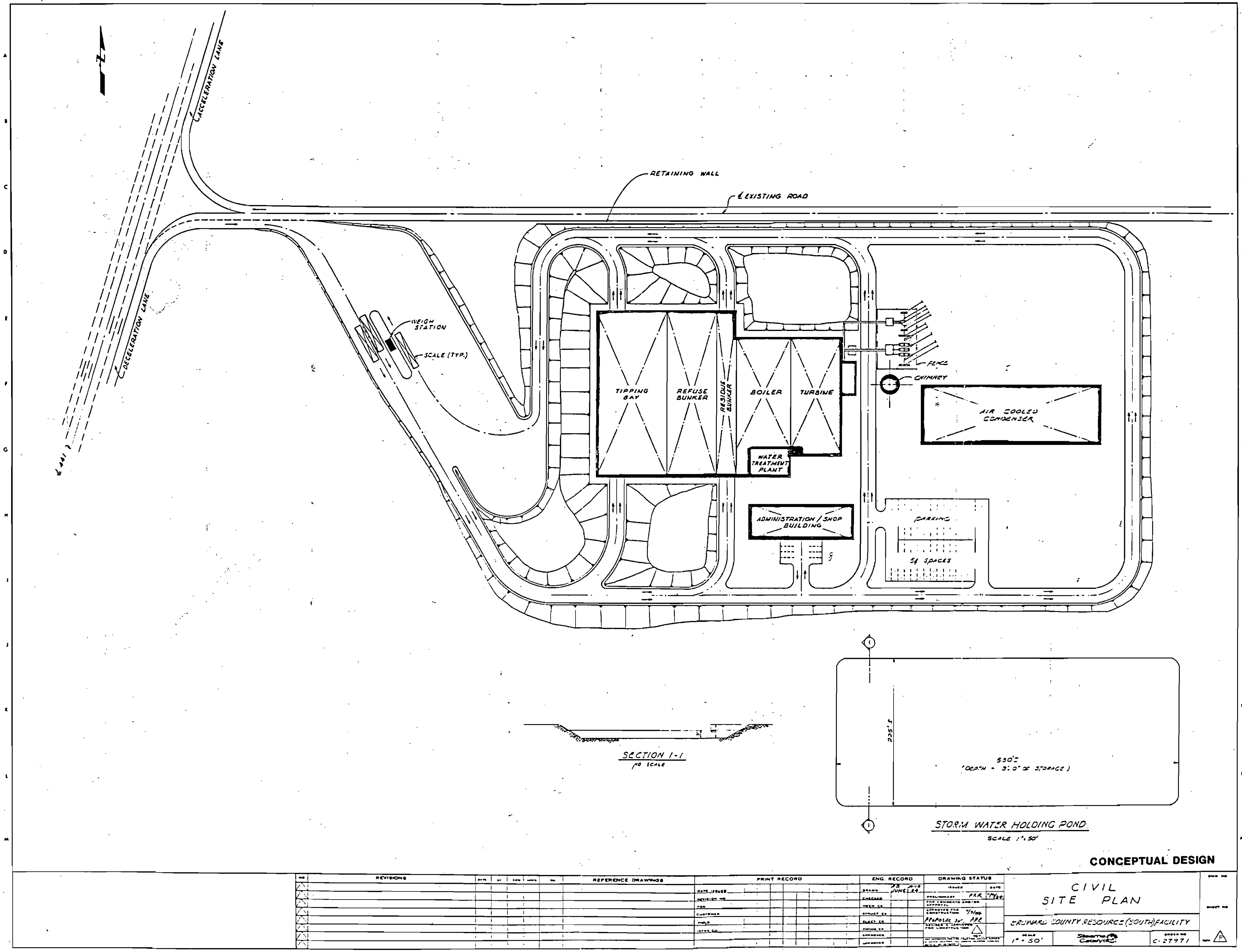
Although a wetlands area is located in the northeastern portion of the site, discussions with the U.S. Army Corps of Engineers (USCOE) indicate that this wetlands area has no special significance in terms of environmental habitat or species. Utilization of this area for the development of the proposed facility requires that a dredge and fill permit be obtained from the USCOE. Preapplication conferences were held with the USCOE and Florida Department of Environmental Regulation (DER) concerning these dredge and fill permits in early November 1983. The County subsequently submitted formal permit applications with appropriate technical support documentation. The USCOE has indicated in its intent to grant the permit via correspondence dated July 13, 1984 (see Appendix 10.1.4), dependent upon the acceptability of the proposed project and associated environmental mitigation program. Likewise, the Florida DER issued a Letter of Intent to issue a dredge and fill permit on September 14, 1984.

A portion of the Project site is within an area Broward County has proposed designating as an Urban Wilderness Area for the preservation of the existing vegetation and habitat. As Figure 2.1.1 illustrates, the proposed facility location and layout provides for substantial buffers between the facility and the remaining sections of the proposed urban wilderness area, South Fork New River Canal and proposed habitat enhancement area.

As indicated on Figure 2.1.2, the resource recovery facility will include a gatehouse/weigh station, receiving and handling building, furnace boilers, turbine-generators, ash disposal area, cooling system, and electrical substation. Security measures will be the responsibility of the selected vendor. Facility access will be via Route 441. To avoid traffic impacts that could result from vehicles queuing on to this public roadway a southbound left turn lane, northbound deceleration an acceleration lane, as well as appropriate traffic signals will be provided by Florida Department of Transportation as part of a widening of Route 441. Roadways supporting internal traffic flow will be arranged to provide congestion-free operation and smooth-functioning facilities.

The facility will include a scale house and three scales. The scales will be on each side of the scale house to accommodate traffic in either direction. The basic traffic flow will be east and west, to and from the receiving area. Once in the

FIGURE 2.1.2


ACCELERATION LANE
DECELERATION LANE
RETAINING WALL
℄ EXISTING ROAD
WEIGH STATION
SCALE (TYP.)
TIPPING BAY
REFUSE BUNKER
RESIDUE BUNKER
BOILER
TURBINE
WATER TREATMENT PLANT
ADMINISTRATION / SHOP BUILDING
FENCE
CHIMNEY
AIR COOLED CONDENSER
PARKING
54 SPACES
SECTION 1-1
NO SCALE
225'±
550'±
(DEPTH = 3'-0" OF STORAGE)
STORM WATER HOLDING POND
SCALE 1"=50'
CONCEPTUAL DESIGN
REVISIONS
REFERENCE DRAWINGS
PRINT RECORD
ENG. RECORD
DRAWING STATUS
CIVIL
SITE PLAN
BROWARD COUNTY RESOURCE (SOUTH) FACILITY
1"=50'
C-27971

receiving area, will move easterly through the facility processes.

The receiving area includes the enclosed turning platform, tipping floor, overhead crane, control room and refuse pit. A separate administrative office building is located to the south of the main process building. Directly east of the receiving area are the furnaces/boilers and auxiliary equipment. Three furnace boiler process lines are to be initially installed with provisions for a fourth system, should future conditions dictate such expansion. To the immediate south of the boiler will be the water treatment system. To the east will be the turbine generators. The air pollution control equipment (electrostatic preciptators) will be located just to the east end of the boilers. The stack will be positioned at the east end of the facility. The electrical substation, necessary to tie into the Florida Power and Light (FP&L) grid system will be located to the north of the facility's stack. This configuration locates the facility stack with a significant buffer from the precision landing approach surface for Runway 9L at the Fort Lauderdale-Hollywood International Airport. In addition, the facility will include: steam and condensate pipelines, storage facilities, and maintenance areas.

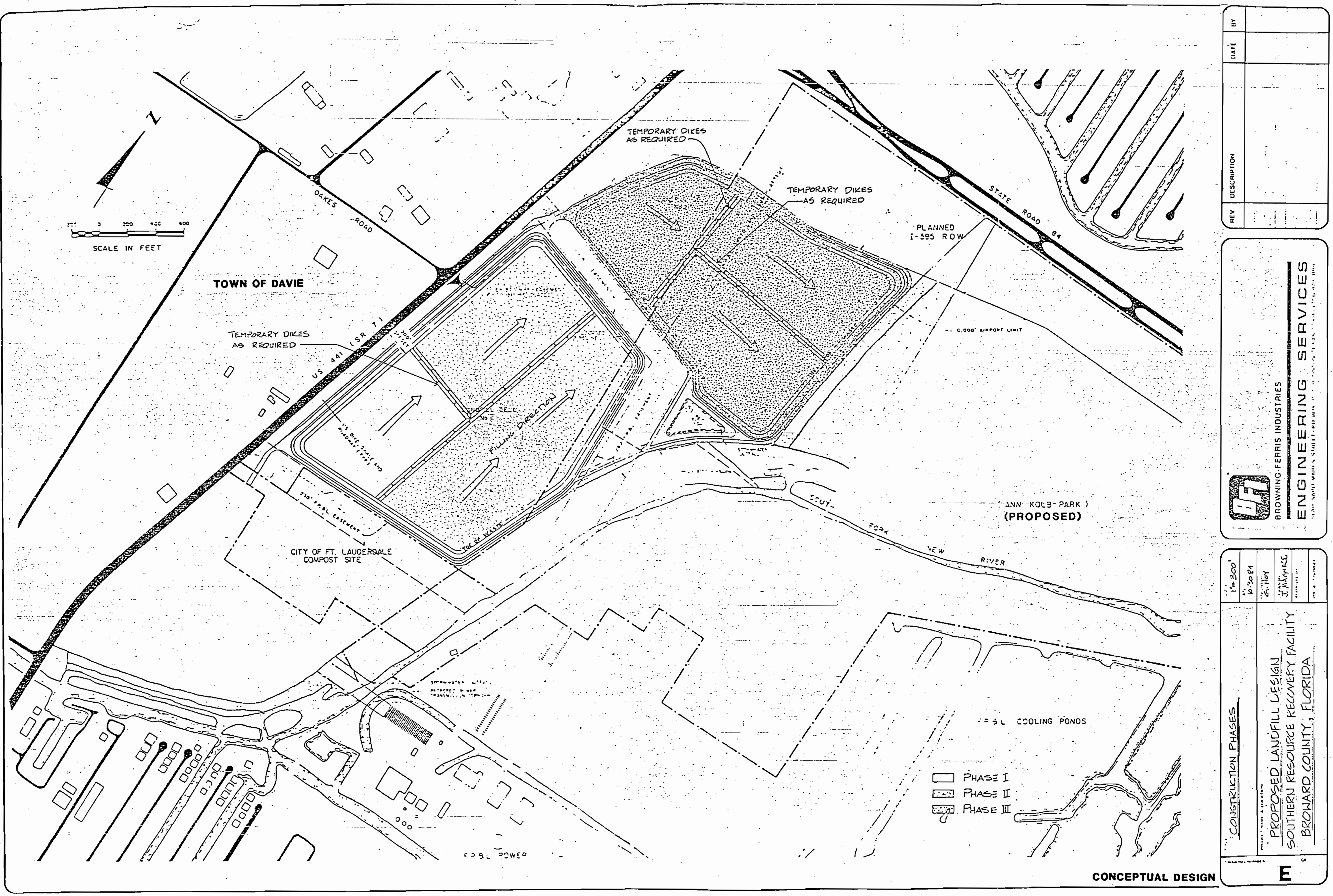
As part of the stormwater management plan developed for the project, a stormwater retention pond(s) will be included in the development of the resource recovery facility.

Ash Residue/Unprocessable Waste Landfill

Figure 2.1.3, Proposed Landfill Design Southern Resource Recovery Facility, illustrates the proposed site utilization and development plan for the two landfill cells and associated facilities. As was the case with Figure 2.1.2, this figure is based upon a vendor proposal, does not indicate a preference for a particular vendor, and may require minor revisions prior

Best Available Copy

FIGURE 2.1.3



CONCEPTUAL DESIGN

to final design. The landfill site is to be located just north of the City of Fort Lauderdale Compost Site (under construction). The landfill will require development of approximately 150 acres. It has been designed to provide the best environmental protection available.

As indicated, on Figure 2.1.3, the landfill area contains two cells: Cell 1, located nearest to the facility will be constructed and filled first; Cell 2, located further north will be developed and filled as quantities of incoming residue and unprocessable wastes dictate such a need. The arrows on Figure 2.1.3 indicate the landfilling plan for each cell.

The entire Route 441 site is located within the 100-year flood zone. The entire site will be excavated to remove peat and muck, etc. Once removed, appropriate fill material will be utilized to raise the entire site to the 100-year flood elevation (+7 feet MSL). A double synthetic liner system with a leachate collection system will then be installed to ensure against contamination of the underlying aquifer. Details of the design are contained in Section 5.3.

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.

The approximate boundaries of this area are:

- North Boundary - 1/2 mile north of Sunrise Boulevard
- East Boundary - 3/4 mile west of John U. Lloyd State Park
- South Boundary - Pembroke Road
- West Boundary - 1/2 mile west of Golden Shoe Road, Davie

FIGURE 2.2.1.1

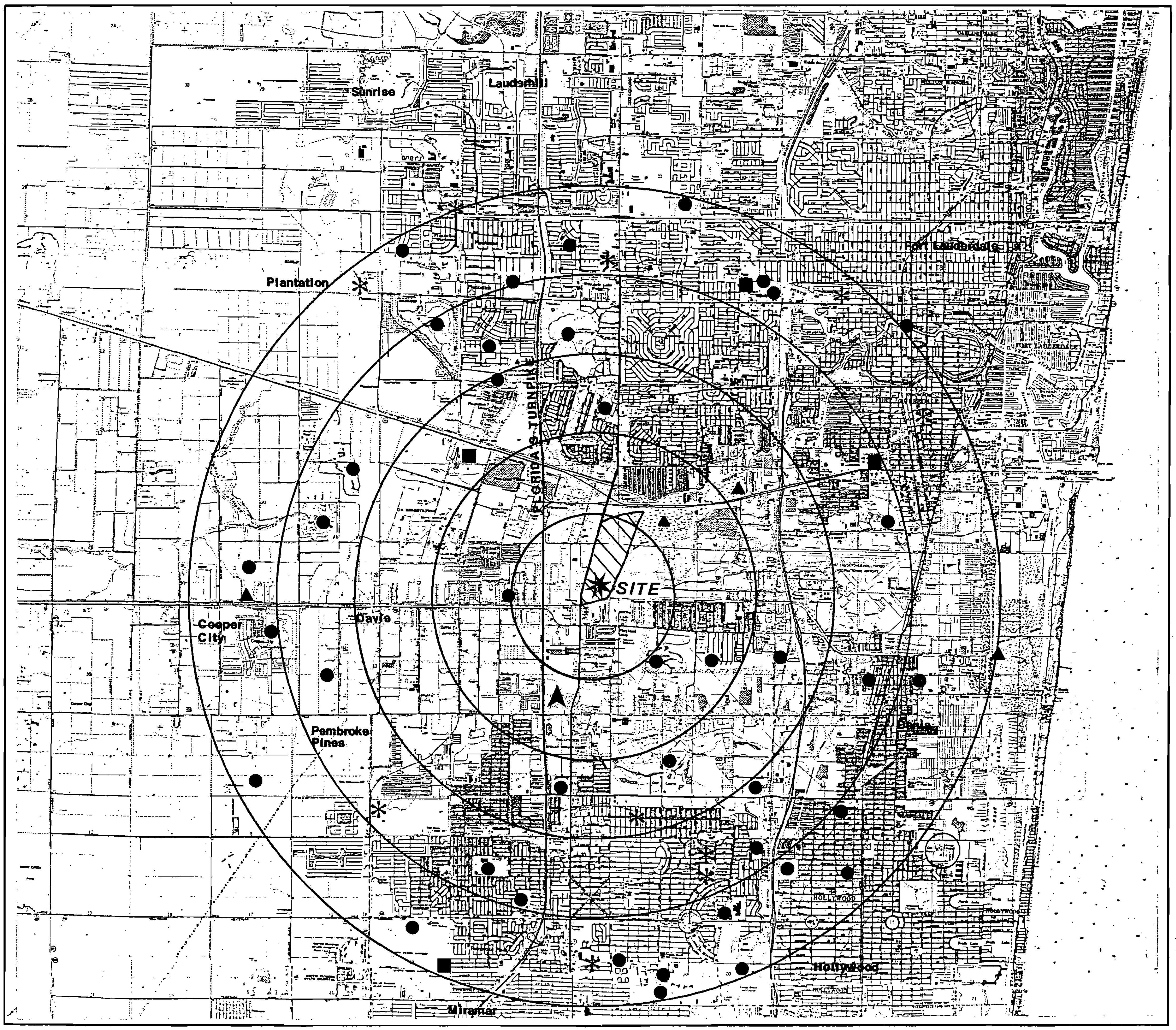
LEGEND

- Parks, & Golf Courses
- Unique Natural Areas
- Memorials
- Hospitals
- Indian Reservation
- Proposed Location of Facility Stack

SCALE:

0 1 2

MILES



BROWARD COUNTY

GOVERNMENTAL JURISDICTIONS AND REGIONAL SCENIC, CULTURAL AND NATURAL LANDMARKS

MALCOLM PIRNIE

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

- o Fort Lauderdale
- o Plantation
- o Dania
- o Hollywood
- o Davie
- o Pembroke Pines
- o Miramar
- o Cooper City
- o Lauderhill
- o Sunrise

In order to identify local, regional, state and federal areas located within a five mile radius of the site, appropriate agencies were contacted. A list of all agency contacts appears in Section 9.

The following areas of concern were identified and plotted on the five mile region map (Figure 2.2.1.1):

- o Memorials
- o Monuments
- o State Parks
- o County Parks
- o City Parks
- o Areas of Critical State Concern & Unique Natural Areas
- o Recreation Lands
- o An Indian Reservation
- o Medical Facilities

As shown on this map, the following specific areas of concern have been identified:

Memorials and Monuments

J.F.K. Memorial Park
Lauderdale Memorial Gardens
West Lawn Memorial Gardens
Lauderdale Memorial Park Cemetery

Parks, Golf Courses, and Indian Reservations & Type of Ownership

Delevoe Park	County
Griffin Park	County
Tree Tops Park	County
Topeekeegee Yugnee (TY)	South Broward Park District
Tigertail Lake Park	County
Snyder Park	Ft. Lauderdale (City)
2-Dania City Parks	City
Surview	County
4-Plantation City Parks	City
Boggs Field City Park	Hollywood (City)
4-Hollywood City Parks	City
David Park	Hollywood (City)
Plantation Heritage Park	County
St. George Park	County
New River Park	State
Brian Piccolo Park	County
Washington Park	County
1-Pembroke Pines City Park	City
West Kenlark Park	County
1-Davie City Park	Davie (City)
Rotary Park	Hollywood (City)
Girl Scout Camp	Davie
Indian Reservation (Seminole)	Federal

Private and Public

Oakridge Country Club	Private
Rolling Hills Golf Course	Public
Arrowhead Country Club & Golf Course	Private
Pines Par Three	Private
Fort Lauderdale Country Club	Private
Plantation Country Club	Private
Sunset Golf Course	Public
Orangebrook Golf Course	Public
Cooper Colony Golf Club	Private
Hillcrest Country Club & Golf Course	Private

Unique Natural Areas and Areas of Critical State Concern

Westlake Mangroves
Pine Island Ridge
Red Mangrove Swamp Site
South Fork New River Site
Secret Woods Nature Center

Hospitals

Pembroke Pines General Hospital
Bennett Community Hospital
Hollywood Psychiatric Pavilion Hospital
Ambulatory Surgical Facility
Broward General Medical Center
Hollywood Medical Center
Hollywood Memorial Hospital
Plantation General
West Broward Hospital

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. A copy of the on-site and off-site mitigation plan is contained in Appendix 10.7.

2.2.2 Zoning and Land Use Plans

On March 16, 1984, the Broward County Board of County Commissioners rezoned the South Broward County Resource Recovery Project site to Planned Unit Development (PUD) which allows for the proposed development. A copy of the Development Review Order implementing this zoning is contained in Appendix 10.2.

As required by FAC Rule 17-17.121(3)(1), three copies of supplemental materials specifying the procedures to accomplish compliance of the site with existing land use plans and zoning ordinances have been submitted to the Florida Department of Environmental Regulation along with this application for site certification. The Compilation of Information Study Report consists of actual Committee meeting minutes, review orders, public hearing information and actual ordinances. The following list is an itemization of the contents of that report:

- o Development Review Committee Meeting - January 19, 1984.
- o Broward County Zoning Board Meeting - February 1, 1984
- o Broward County Board of County Commissioners Meeting - March 16, 1984
- o Copy of Ordinance #84-6(Z) - April 23, 1984
- o Copy of Ordinance #84-7(Z) - April 23, 1984

A summary of these documents and their dates are presented in chronological order (Table 2.2.1).

The proposed resource recovery facility is consistent with the Broward County Comprehensive plan and projected land use development. Specifically, there appears to be no distinction made that would preclude the development of resource recovery project at this site in any of the Broward County Comprehensive Plan Subelements.

Specific project parameters have been outlined with respect to their consistency with Broward County Comprehensive Plan Subelements and are presented on Table 2.2.2.

Existing land use on the site includes industry by Powell Brothers, Inc., a marine construction contractor with an office adjacent to U.S. Route 441 and fabrication yard adjacent to the South Fork New River Canal. The extreme northeastern corner of the site is a proposed Urban Wilderness Area. The resource recovery facility will be located at least 400 feet from the nearest area zoned residential.

Figure 2.2.2.1 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

TABLE 2.2.1

ZONING AND LAND USE CHRONOLOGY

January 25, 1983 -	The 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 (Agenda Item No. 65D).
April 12, 1983 -	The Board of County Commissioners: Adopts the recommendation of the March 1983 Site Evaluation Report prepared by Malcolm Pirnie, Inc. (Agenda Item No. 68A). Authorizes staff to secure all necessary information and to conduct negotiations for acquisition of the Route 441 site for resource recovery/disposal facilities (Agenda Item No. 68B).
January 19, 1984 -	The Broward County Development Review Committee votes to recommend to the Broward County Zoning Board the rezoning of the Route 441 Resource Recovery Project site from A-1, Limited Agricultural; B-3, General Business; M-1, Light Industrial, M-3, General Industrial and M-4, Limited Heavy Industrial to Planned Unit Development for Special Complexes.
February 1, 1984 -	The Broward County Zoning Board votes to recommend to the Board of County Commissioners the rezoning of the Route 441 Resource Recovery Project site from A-1, Limited Agricultural; B-3, General Business; M-1, Light Industrial; M-3, General Industrial and M-4, Limited Heavy Industrial to Planned Unit Development for Special Complexes.
March 16, 1984 -	The Board of Commissioners approve the rezoning of the Route 441 Resource Recovery Project site from A-1. Limited Agriculture; B-3, General Business; M-1, Light Industrial; M-3, General Industrial and M-4, Limited Heavy Industrial to Planned Unit Development for Special Complexes.

TABLE 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 has been deemed compatible with existing and future land use by the Broward County Board of County Commissioners.
	o The energy recovery facility is interrelated with other light industrial activities in the area.
	o The energy recovery facility incorporates modern design techniques. The facility will not have adverse external impacts and is compatible with the surrounding area.
Traffic Circulation and Mass Transit	o Transportation has been reviewed during the land use plan amendment and rezoning processes.
	o The site location minimizes truck route distances for solid waste collection and disposal.
Aviation	o The project has been approved by the Federal Aviation Administration.
Port Everglades	o This element is not directly applicable to the proposed project.

MALCOLM PIRNIE

TABLE 2.2.2

CONSISTENCY WITH THE COMPREHENSIVE PLAN[1] (continued)

Element of Comprehensive Plan	Project Consistency Summary
Housing	o The energy recovery facility will not impact the creation or maintenance of healthy and viable living environment.
Water and Sewer	o The Hollywood Wastewater Treatment Plant will treat discharges from the energy recovery facility.
Drainage	o The proposed stormwater drainage system meets the requirements of the South Florida Water Management District and DER.
Utility	o The Public/Semi-Public Land Use designation serves to inform the public of the location of the energy recovery facility.
	o The energy recovery facility helps Florida Power and Light meet its goals and objectives in the Electric Utility Subelement.
Parks, Recreation and Open Space	o Open space resources were taken into consideration during site selection activities. New recreation areas will be created through mitigation.
Conservation	o The energy recovery facility was sited to avoid impacts to conservation/reservation areas.
Coastal Zone Protection	o The energy recovery facility by means of the mitigation plan will enhance the area next to the South Fork New River Canal.
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.

FIGURE 2.2.2.1

LEGEND

*Residential Densities

Low (0-10 Dwelling units per acre)*

Medium (10-25 Dwelling units per acre)*

High (25-50 Dwelling unit per acre)*

Agricultural

Industrial

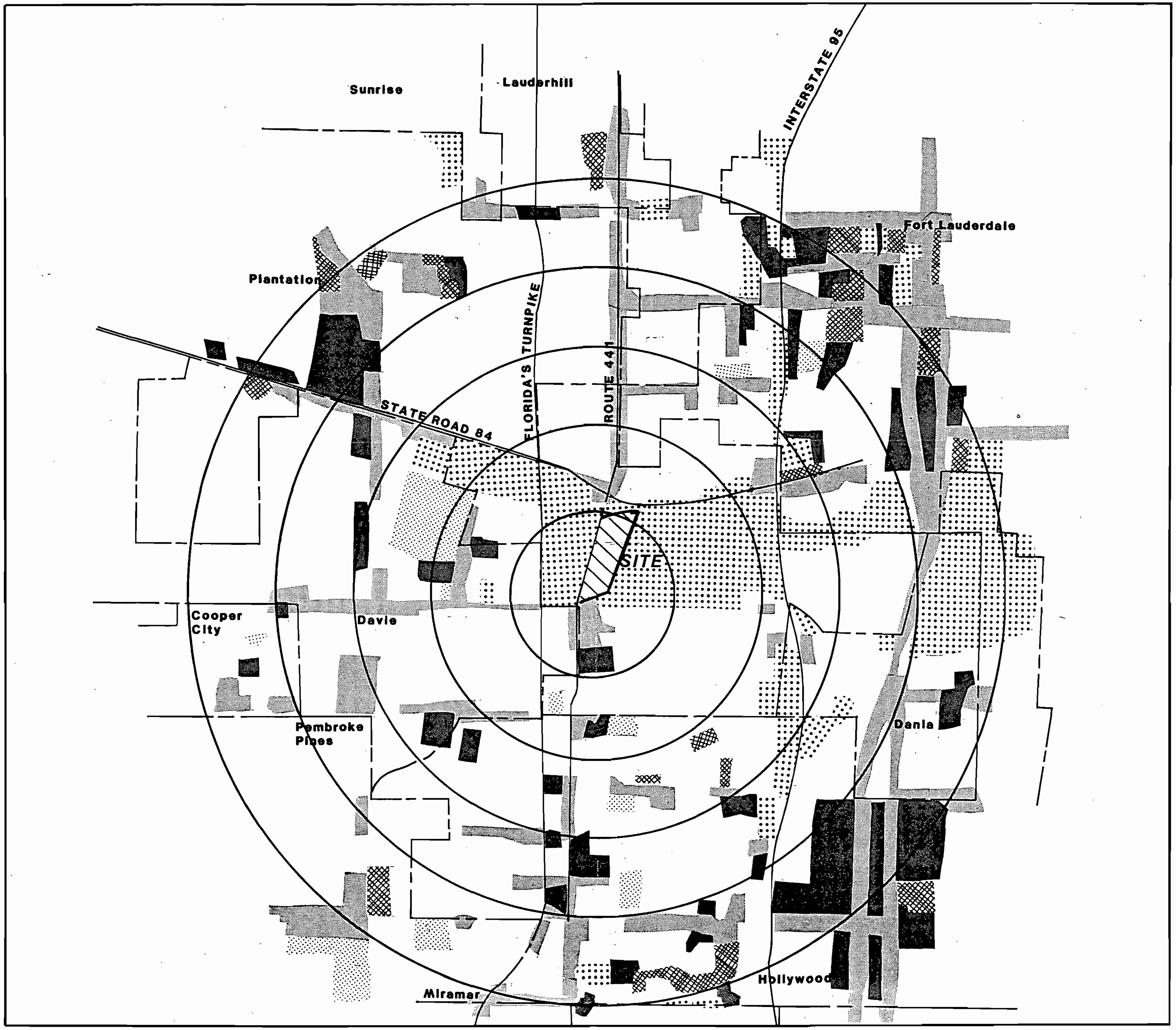
Commerical

City Boundaries

SCALE:

0 1 2

MILES



MALCOLM PIRNIE

BROWARD COUNTY

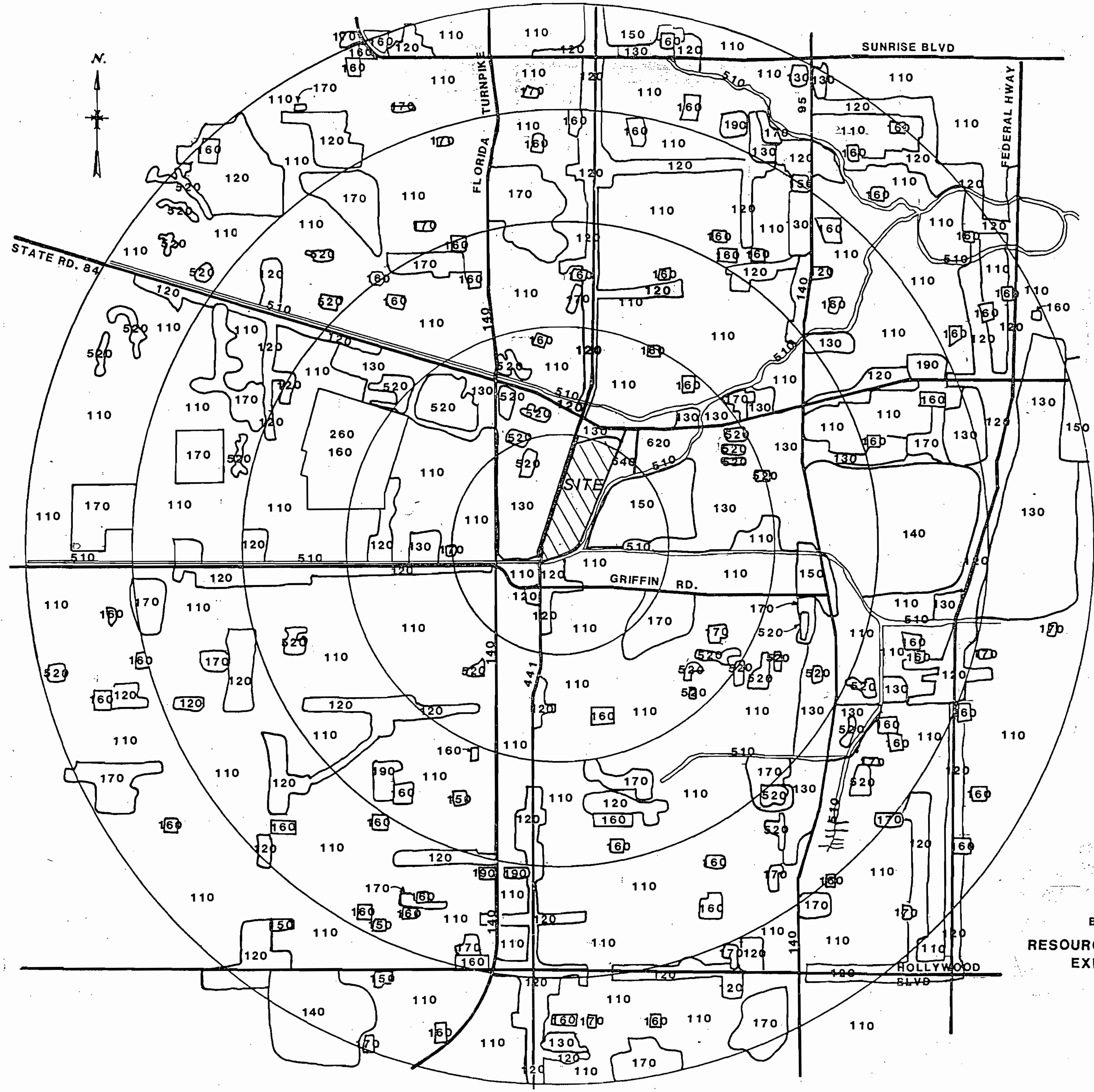
LAND USE PLAN MAP

MARCH 1985

FIGURE 2.2.2.2

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

MARCH 1985

- o Commercial
- o Industrial
- o Agricultural

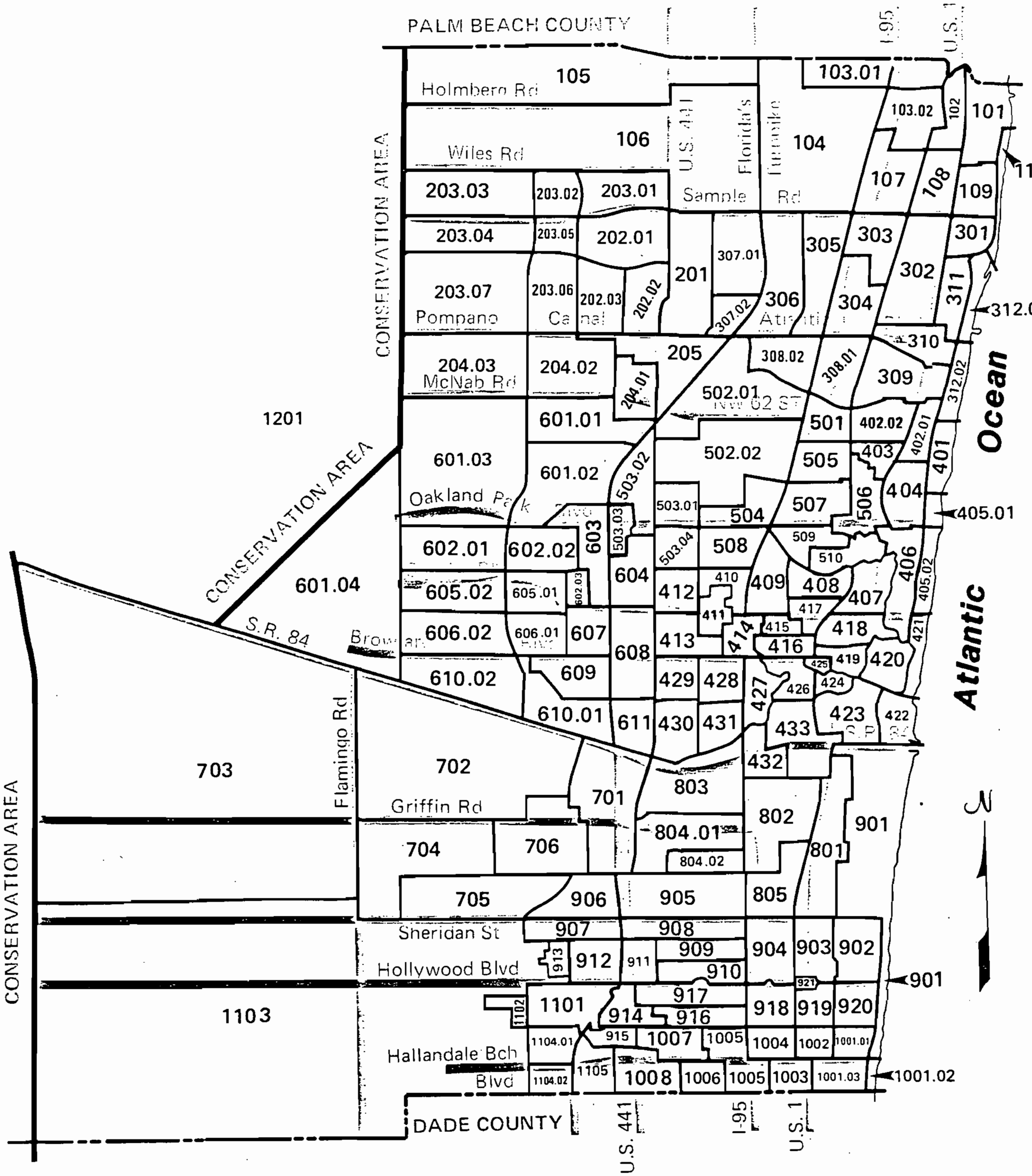
Using Level II categories of the Florida Land Use and Cover Classification System, additional land uses are provided for the 5 mile area around the site on Figure 2.2.2.2.

2.2.3 Demography and Ongoing Land Use

Figure 2.2.3.1 is a 1980 census tract map of Broward County. Existing resident population data corresponding to each census tract is presented in Table 2.2.3.1. Resident population by municipality is provided on Table 2.2.3.2.

As illustrated in the previous section on Figures 2.2.2.1 and 2.2.2.2, 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. Appendix 10.3 contains a letter from the Broward County Planning Council certifying that information provided on the land use map is current and valid (Exhibit B, Appendix 10.3). Detailed information on vegetation and land use is provided in Section 2.3.5.

In November 1984, the County conducted a Solid Waste Centroid Analysis specifically aimed at tracking the movement of population in the area servicing the southern Broward communities. The purpose of this study was to identify projected shifts in population that might have an effect on facility siting. Figure 2.2.3.2 illustrates the movement of population for the years 1980 through 2020. As illustrated, presently, the solid waste centroid is located adjacent to the site. Projected movement of the centroid, in a southwesterly direction is consistent with County projections for growth and development in that region. There are no abnormal changes in population trends or industrial patterns anticipated for this



SOURCE: BROWARD COUNTY STATISTICAL SUMMARY 1983

1 0 1 2 3
GRAPHIC SCALE - MILES

BROWARD COUNTY, FLORIDA

1980
CENSUS TRACTS

TABLE 2.2.3.1

BROWARD COUNTY, 1970 AND 1980

RESIDENT POPULATION BY CENSUS TRACT

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

Census Tract	April 1 1970	April 1 1980
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		9,684
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	8,877
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

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

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**

BROWARD COUNTY
SOLID WASTE CENTROID ANALYSIS

To establish solid waste centroids for the Broward County communities projected to utilize the proposed southern interim/contingency landfill, Malcolm Pirnie employed its centroid analysis computer program. Population data provided by The Economic Research Section of the Plan Implementation Division, Broward County Office of Planning was used as input for the centroid analysis program for the years 1980, 1990, 2000, 2010 and 2020. Centroids were then independently, calculated for each year.

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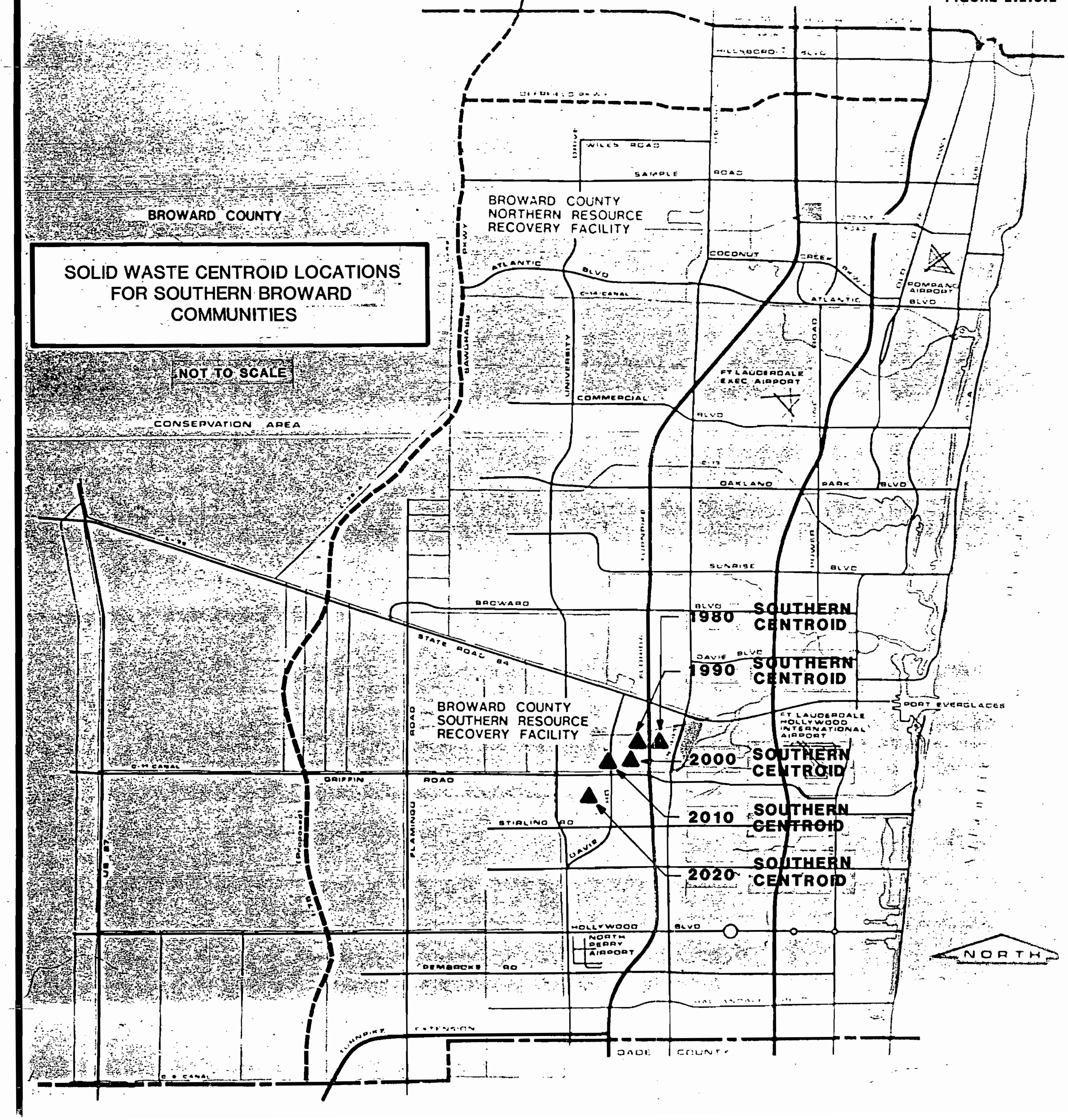
FIGURE 2.2.3.2



area. As a result, the siting of the resource recovery facility at the Route 441 site will accommodate projected County population growth as well as remain at a close proximity to the projected solid waste centroid.

2.2.4 Easements, Title, Agency Works

As previously mentioned in Section 2.1, development of the site will consist of the resource recovery facility in the southern portion of the site and ash residue unprocessable waste landfill cell development in the middle and northern portion of the site. The two independent landfill cells will be separated from the resource recovery facility by the City of Ft. Lauderdale Compost Facility (under construction). Thus, internal traffic will be required to cross Fort Lauderdale property for disposal of unprocessable waste and ash residue. Existing Florida Power & Light (FP&L) power line easement crossing the site from the north (State Road 84) to Oaks Road will be relocated adjacent to the existing power line easement crossing the site from the west (Route 441) along Oaks Road. In addition, a 6-inch diameter Sunniland Pipe Line Company petroleum pipe line located in the north south easement will be relocated to the east west easement (Oaks Road). Florida Gas has also indicated that their 16 inch diameter gas line located in the Oaks Road easement will be joined by another 18-inch line. The two lines will require 15 feet of space between them. Broward County has continued to interface with FP&L concerning easement use. The easement will serve as a buffer zone and will be used for stormwater retention.

Broward County and the Florida Department of Transportation entered into a joint acquisition agreement involving those parcels common to the landfill site, construction of Interstate 595, and the Route 441/Interstate 595 intersection. Subsequently, agreement was reached whereby Broward County has acquired all of the acreage necessary for development of the resource recovery facility and unprocessable waste landfill and associated facilities.

To the immediate northeast of the site, 20 acres are reserved for Interstate 595. Additionally, an 130 acres area known as the proposed Anne Kolb Park (also known locally as the pond apple slough) is owned by the Department of Natural Resources for I-595 mitigation adjacent to the northeastern portion of the site. The aforementioned projects, both proposed and under construction, and the land easements that exist on or around the site will not adversely affect project development.

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:

- Tourist Attractions
- Shopping Malls
- Educational Facilities
- Airports

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

Elementary and Middle Schools

Apollo Middle School
Attucks Middle School
Bethune, Mary M. Elementary
Boulevard Heights Elementary
Broward Estates Elementary
Collins Elementary
Cooper City Elementary

Croissant Park Elementary
Dania Elementary
Davie Elementary
Driftwood Elementary
Driftwood Middle School
Edgewood Elementary
Eisenhower D.D. Elementary
Foster, Stephen Elementary
Harbordale Elementary
Hollywood Hills Elementary
Hollywood Park Elementary
Hortt Elementary
Larkdale Elementary
Meadowbrook Elementary
New River Middle School
North Fork Elementary
Nova Middle School
Oakridge Elementary
Olsen Middle School
Orangebrook Elementary
Parkway Middle School
Pasadena Lakes Elementary
Pembroke Pines Elementary
Peters Elementary
Pineridge Elementary
Pines Middle School
Pioneer Middle School
Plantation Elementary
Plantation Middle School
Plantation Park Elementary
Riverland Elementary
Rogers Middle School
Sasal Palm Elementary
Seminole Middle School
Sheridan Hills Elementary
Sheridan Park Elementary
Stirling Elementary
Sunland Park Elementary
Tropical Elementary
Walker Elementary
West Hollywood Elementary
West Heights Elementary

High Schools

Cooper City High School
Hollywood Hills High School
McArthur High School
Nova High School
South Broward High School
South Plantation High School

Stranahan High School
St. Thomas Aquinas High School

Other Educational Facilities

Board of Public Instruction
Downtown Adult Center
ITV Center (Instructional T.V.)
Melrose Park Center
The Quest Center
Reading Center
Seagull School
Sheridan Vocational Center
Southside (Cyesis) Center
Wingate Oaks Center
University of Florida Agricultural Exp. Stat.
South Florida Educational Center
Broward Community College
Nova University

Principal County Tourist Attractions or Shopping Malls (within 5 Miles)

Broward Mall
Hollywood Mall
Lauderhill Mall
Archaeological Museum/Historical Commission
Atlantis, The Water Kingdom
Beuhler Planetarium
Castle Park
Dania Jai-Alai Fronton
Davie-Cooper City Rodeo
Discovery Center
Ft. Lauderdale Historical Society
Giant Waterslide
Grand Prix Race O-Rama
I-95 Grand Prix & Games
King - Cromartie House
Museum of Art
Ocean World
Bob Roth's New River Groves
Seminole Indian Rodeo
Spykes Grove & Tropical Gardens

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 10.18 provides further details on this issue.

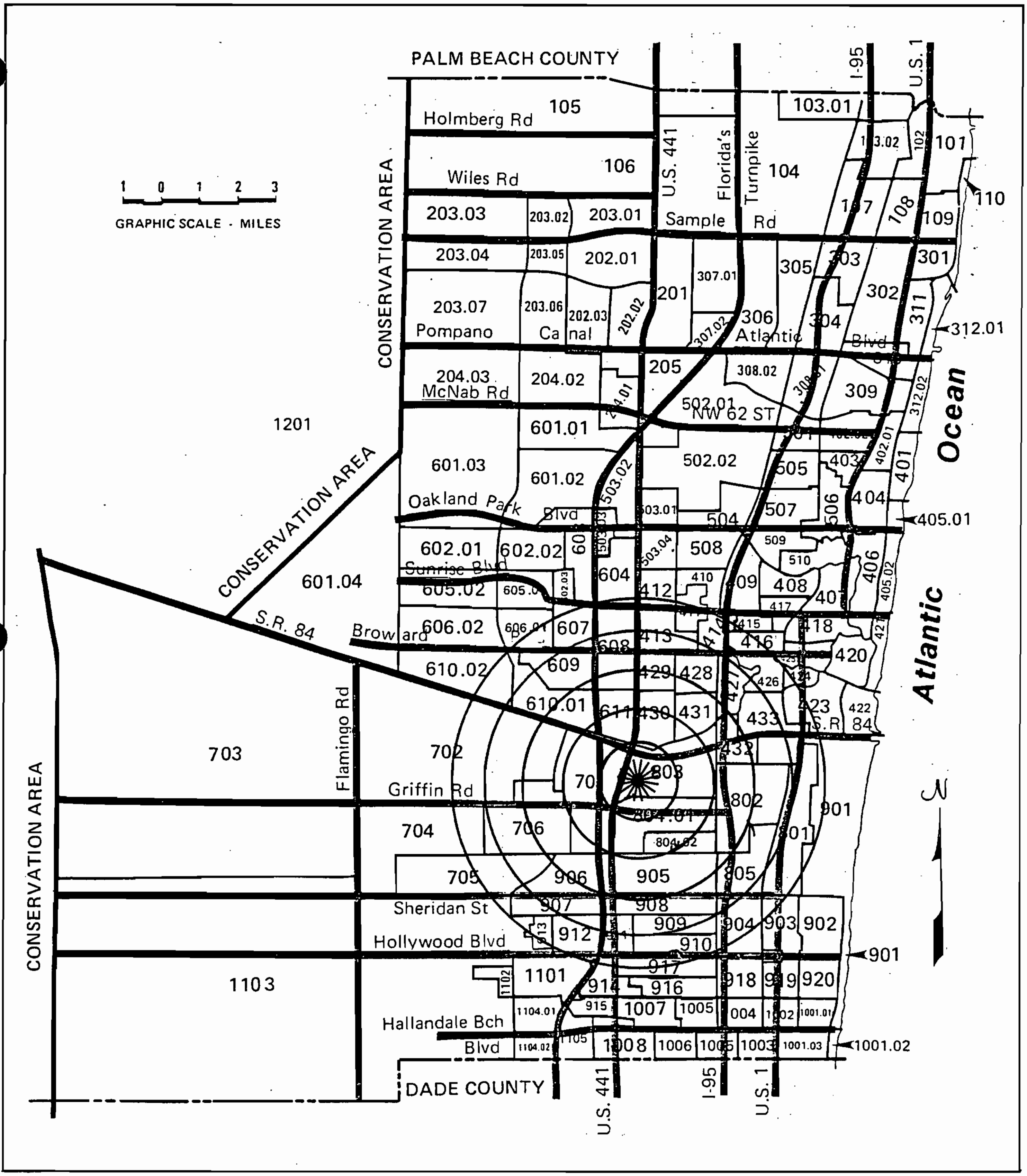
2.2.7 Socioeconomics and Public Services

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. It is anticipated that approximately 60 percent of the total Broward County population will be serviced by the southern resource recovery facility. Figure 2.2.7.1 details the 1980 census population counts for those census tracts partially or wholly located within five miles of the site. The site is located in census tract 803. In 1980 the population of census tract 803 was 2,583. In aggregate, 1980 census populations for all census tracts located within 5 miles of the site was 353,839.

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.

Employment by Occupation in the Industrial Sector. Table 2.2.7.2 presents 1983 employment statistics by occupation (except agriculture) for Broward County.



SOURCE: BROWARD COUNTY STATISTICAL SUMMARY 1983

BROWARD COUNTY

1980 CENSUS TRACTS
FIVE MILE RADIUS AROUND SITE

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

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

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General Income Characteristics. Within the 5 mile radius of the proposed Route 441 site there is a combination of high and low median household incomes. The City of Plantation contains a majority of the upper income households. The City of Fort Lauderdale contains a majority of the lower income 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 eleven cities in the area, the primary source of income is wages and salary. Approximately 55 percent of the land in the area is used for light residential housing (see Figure 2.2.2.1).

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.

Existing Housing Stock. Housing statistics are shown in Table 2.2.7.3. Cooper City has the greatest proportion of owner-occupied housing units (89%), while the City of Dania has the lowest (46%).

Building Activity. Multi-family housing units represented the largest proportion of building activity in Broward County between 1970 and 1983. Table 2.2.7.4 presents municipality building activities based on building permits issued to build within five miles of the proposed site. Table 2.2.7.5 presents information pertaining to residential building permits issued for the entire County.

Housing Costs. Of those census tracts partially or wholly within the 5 mile radius of the site, average median housing value is highest in Plantation. Median housing values and condominium values for the same area are shown in Table 2.2.7.6.

TABLE 2.2.7.3

EXISTING HOUSING INFORMATION, 1980

		Occupied Year Round Housing Units			Vacant Year-Round Housing Units			
Municipality	Total Housing	Total	Owner Occupied	Renter Occupied	Total	For Sale	For Rent	Other
Cooper City	3,388	3,292	3,007	285	96	12	5	79
Dania	6,057	5,051	2,813	2,238	1,006	49	226	731
Davie	8,081	7,503	5,531	1,972	578	160	116	302
Fort Lauderdale	78,242	67,623	38,012	29,611	10,619	754	2,492	7,373
Hacienda Village[1]	93	72	54	18	21	1	-	20
Hollywood	56,857	50,764	34,289	16,475	6,093	340	1,403	4,350
Lauderhill	19,561	16,525	9,416	7,109	3,036	771	419	1,846
Miramar	12,145	11,647	9,860	1,787	498	102	57	339
Pembroke Pines	14,349	12,691	11,196	1,495	1,658	95	59	1,504
Plantation	17,882	16,810	14,247	2,563	1,072	288	156	628
Sunrise	17,225	16,022	13,310	2,712	1,203	85	131	987

1. Abolished through annexation to Town of Davie via referendum approved by voters on September 7, 1984.

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TABLE 2.2.7.4

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

Municipality	1983 Single Family	1983 Duplex	1983 Multi-Family	1983 Total	1970-1983 Single Family	1970-1983 Duplex	1970-1983 Multi-Family	1970-1983 Total
Cooper City	532	-	-	532	3,335	30	174	3,539
Dania	5	4	24	33	470	348	1,854	2,672
Davie	345	10	110	465	3,274	382	5,699	9,355
Fort Lauderdale	34	44	62	140	2,153	1,222	13,766	17,141
Hacienda Village[1]	-	-	-	-	-	2	-	2
Hollywood	63	42	455	560	3,191	1,044	11,500	15,735
Lauderhill	294	-	317	611	4,893	294	15,380	20,567
Miramar	321	2	173	496	2,748	422	1,084	4,254
Pembroke Pines	389	-	227	616	7,924	2	6,908	14,834
Plantation	154	24	921	1,099	5,028	296	7,325	12,649
Sunrise	499	134	782	1,415	7,532	250	13,784	21,566
Total	2,636	260	3,071	5,967	40,548	4,292	77,474	122,314
	44%	4.4%	51.5%		33.2%	3.5%	63.3%	

1. Now part of Town of Davie via referendum approved by voters on September 7, 1984.

TABLE 2.2.7.5

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

TABLE 2.2.7.6

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

Municipality	Non-Condo	Condo
Cooper City	$ 82,242	$ 48,388
Dania	58,902	48,303
Davie	88,051	54,620
Fort Lauderdale	84,013	81,295
Hacienda Village[1]	37,666	-
Hollywood	66,554	58,963
Lauderhill	66,583	51,957
Miramar	60,253	49,459
Pembroke Pines	73,254	58,485
Plantation	105,895	56,599
Sunrise	65,061	43,374

1. Now part of Town of Davie via referendum approved by voters on September 7, 1984.

2.3 Biophysical Environment

2.3.1 Geohydrology

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 incorporate an ash residue/unprocessable waste landfill, a detailed description of site-specific hydrogeologic characteristics has been included in this section. In addition, the site-specific aquifer and surface water characteristics have been developed 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 materials in Broward County to a depth of approximately 300-400 feet are limestone and some sand which range in age from Pleistocene to Late Miocene (from 1 million to 25 million years old).

The Biscayne Aquifer system, the major potable water source for south Florida, underlies all of Broward County with the exception of certain coastal areas where salt water intrusion has occurred. This system is comprised of highly permeable limestones and sandstones and 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 and contains so much unconsolidated material that wells often must be cased to the main water horizon, and screens may be required to provide the well finish. 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 some 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 salty water near the base of the aquifer (Vorhis, 1948) also suggests that a low-permeability zone may have entrapped connate water or relict seawater by retarding ground water movement.

TABLE 2.3.1.1

TYPICAL LITHOLOGY - USGS WELL G515[1]

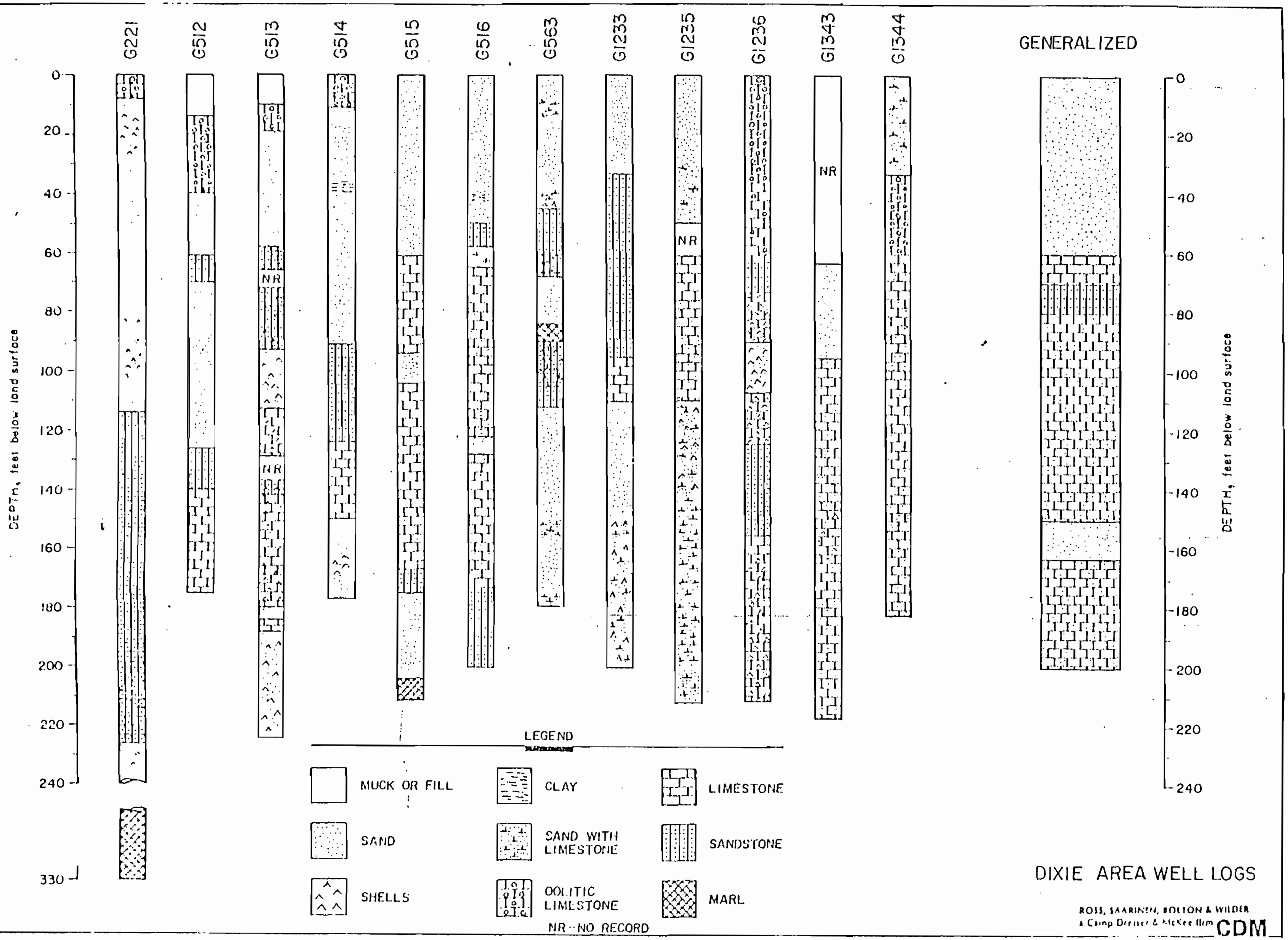
Location: N.E. 1/4 S.W. 1/2 Section 12, T. 50 S., R. 41E., in center of Fort Lauderdale Golf and Country Club, near City Well 6.

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.

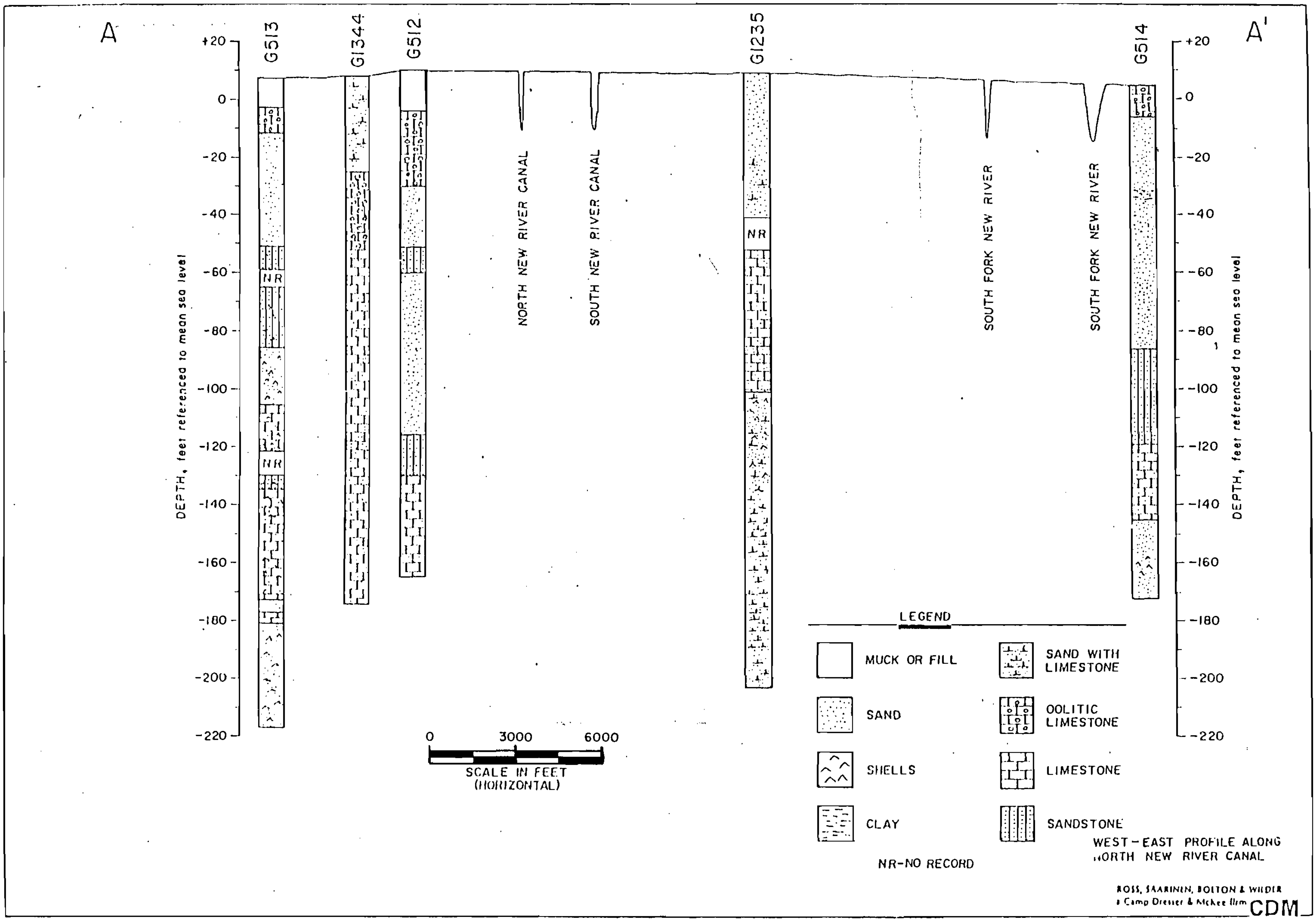
FIGURE 2.3.1.1



DIXIE AREA WELL LOGS

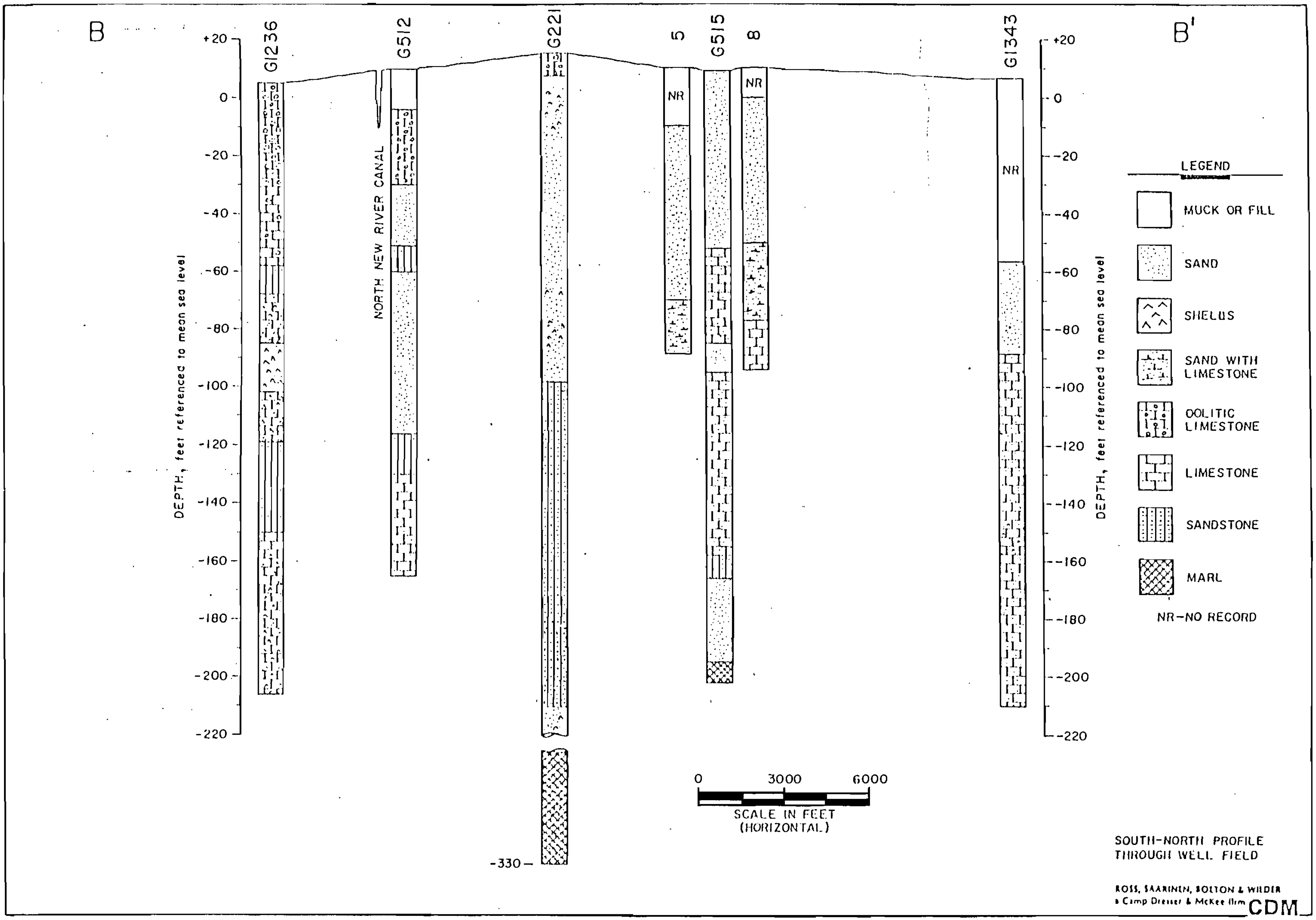
ROSS, SAARINEN, BOLTON & WILDER
a Camp Dresser & McKee firm
CDM

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

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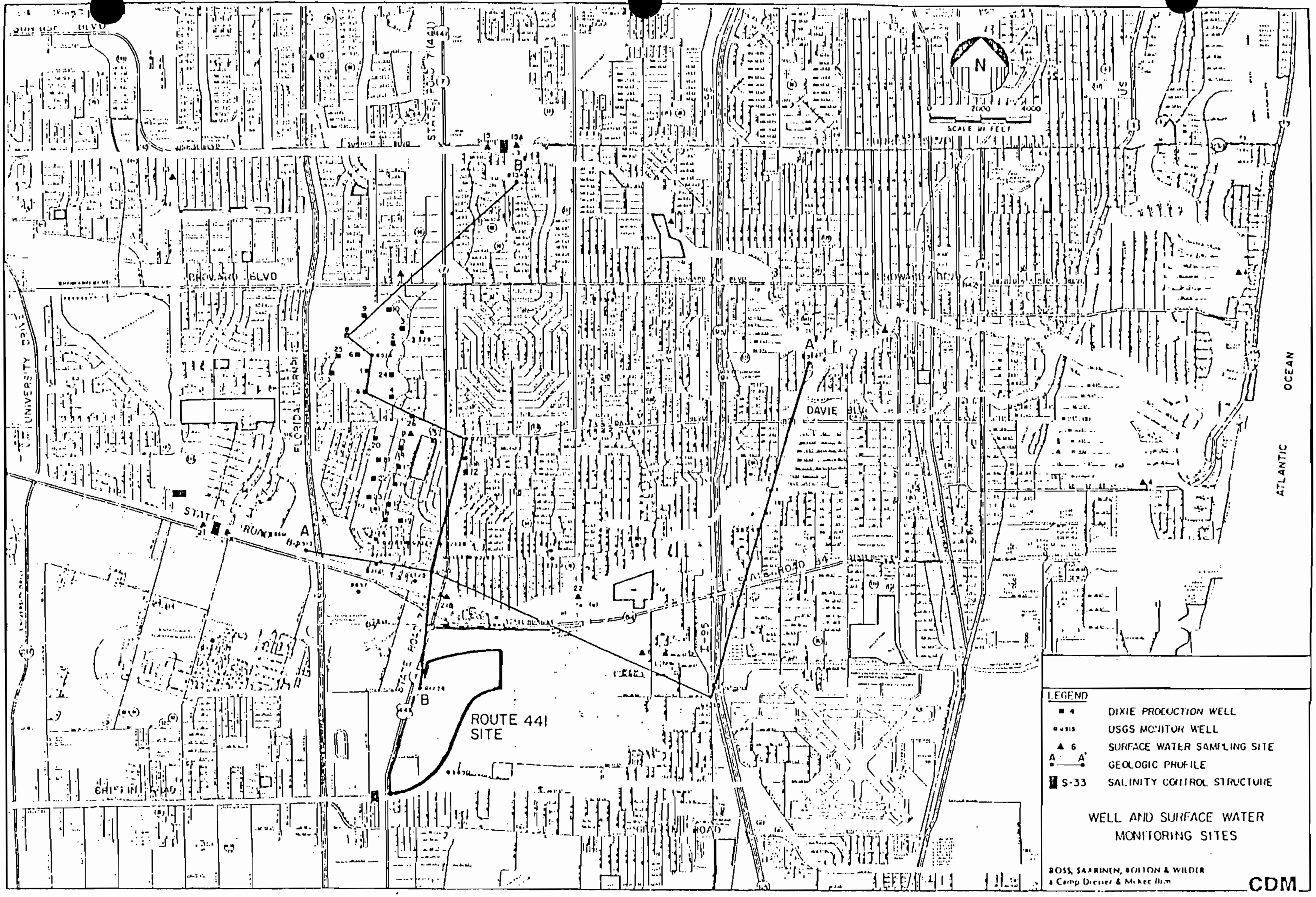
FIGURE 2.3.1.4



Note: Cross Sections Shown on Figures 2.3.1.2 and 2.3.1.3

2.3.1.2 Detailed Site Lithologic Description

Information contained in this section has been developed from exploratory borings taken as part of the site selection and geotechnical investigation efforts of Broward County's Resource Recovery Program. Specifically, the following geotechnical studies were performed at the facility site in the areas specified:

- Malcolm Pirnie, Inc. drilled two (2) groundwater test well clusters located in the Residue/Unprocessable Waste Landfill and numerous test borings throughout both the landfill and resource recovery facility project sites (Figure 2.3.1.5).

- KBC Consultants, Inc. conducted a detailed geotechnical analysis of the City of Fort Lauderdale's Sludge Composting Facility located immediately adjacent to the resource recovery facility.

- East Coast Testing and Engineering performed a study of the Powell Brothers Industrial Tract which is located within Cell No. 1 of the residue/unprocessable waste landfill.

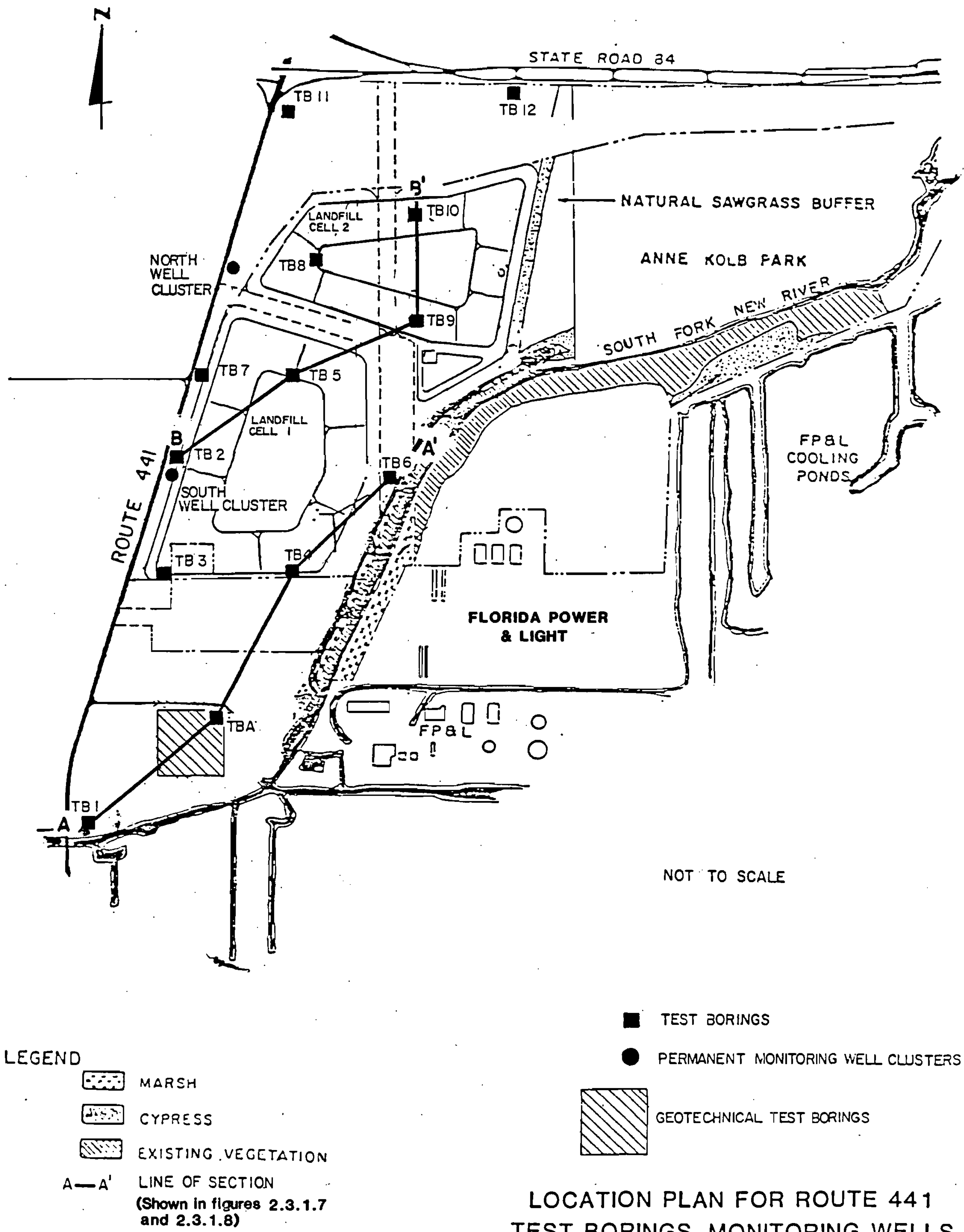
- Florida Testing and Engineering studied the Griffey Tract which coincides with the eastern portion of the landfill Cell No. 2.

The four reports are corroborative on soil types, groundwater elevations, and depth to rock layer. Analyses were made by standard field and laboratory geotechnical methodologies. Copies of the reports are provided in Appendix 10.8.

Due to the corroborative nature of the above referenced reports, the following description of site soils and lithology represents a summary incorporating data from each report.

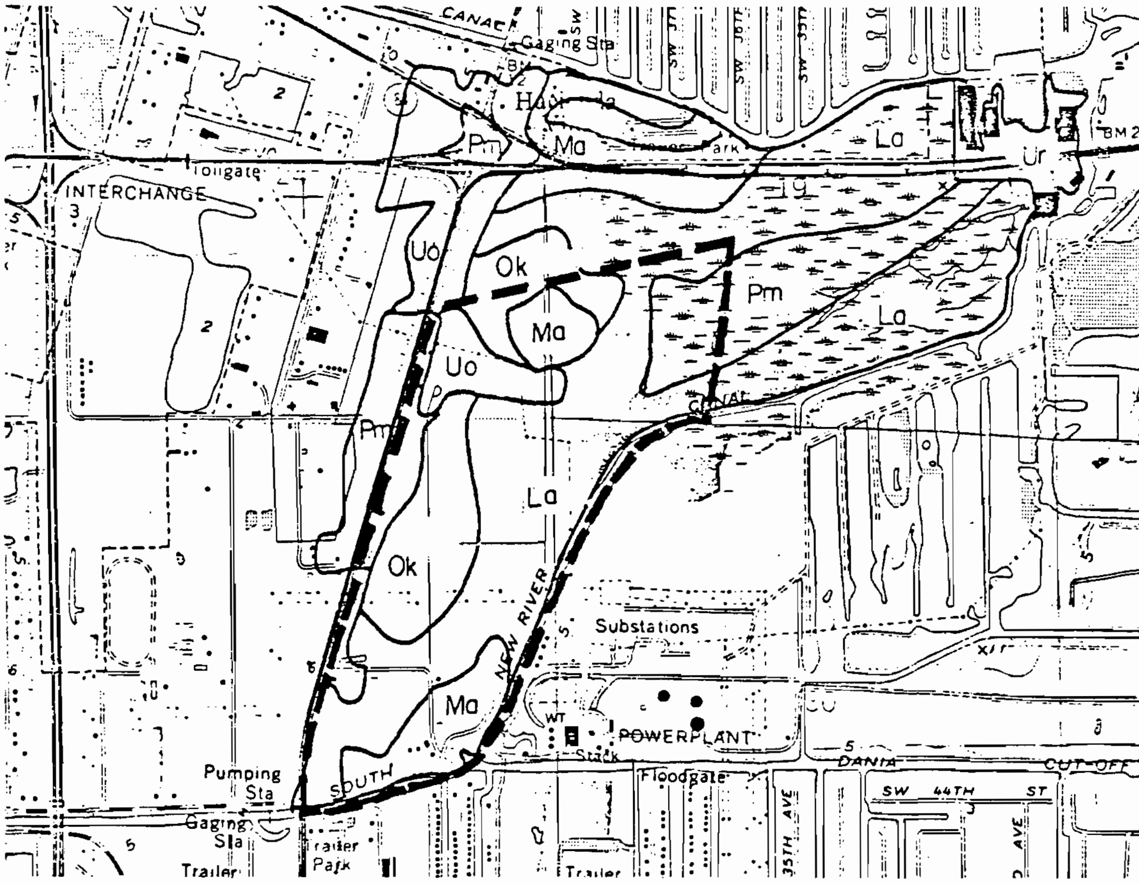
Site Soils

Information on existing soils at the Route 441 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 hydrogeologic data. Figure 2.3.1.6 delineates the principal



LOCATION PLAN FOR ROUTE 441 TEST BORINGS, MONITORING WELLS, AND LINES OF SECTION

FIGURE 2.3.1.6



SCALE: 1:24,000

Soil Mapping Units

La: Lauderhill muck
Ma: Margate fine sand
Ok: Okeelanta muck
Pm: Plantation muck
Un: Udorthents
Uo: Udorthents
Ur: Udorthents
Soil Boundary : Ma Ok
Site Boundary :

Note:

1. Taken from Soil Survey of Broward County, Florida, U.S.D.A. Soil Conservation Service.

ROUTE 441 SITE
SOIL MAP

soil units at the site. Selected soil morphological characteristics and engineering properties are presented in Table 2.3.1.2.

The Route 441 site is covered by a 0.5 to 4 foot thick layer of peat and muck. The peat and muck layer overlies silica and/or calcareous sand with limestone and shell fragments. Semi-consolidated bedrock is encountered between 2 to 10 feet below ground surface and is composed of limestone and oolitic limestone interlayered with sand and marl.

Except for disturbed portions (Udorthents) the site is subject to seasonal flooding. The Broward County soil survey classifies the on-site soils as being poorly drained (soils wet for long periods of time; drainage mottles in mineral soil are between 0 and 10 inches from ground surface).

Site Lithology

The geologic logs developed from borings installed by Malcolm Pirnie (Figure 2.3.1.5) were used to construct the geologic cross sections shown on Figures 2.3.1.7 and 2.3.1.8. Site- specific shallow geologic conditions appear to be similar to conditions within 1 to 2 miles of the site as can be noted by a comparison of Figures 2.3.1.1 (Dixie area well logs), 2.3.1.2, and 2.3.1.3 (regional cross sections shown on Figure 2.3.1.4) with Figures 2.3.1.7 and 2.3.1.8 (site-specific cross sections). The shallow subsurface materials at the site are predominantly oolitic limestone with discontinuous layers of unconsolidated sand and marl. Both cross sections demonstrate the variability in lithology throughout the site which is generally a result of solutioning of large portions of the limestone zones and subsequent filling with sand from the upper unconsolidated zones. Geologic Cross Section A-A' (Figure 2.3.1.7) shows a continuous layer of naturally occurring peat (average thickness of 3 feet) from the canal on the eastern limits of the site to Route 441 (State Road 7) on the western limit of the site. This is underlain by a layer of

TABLE 2.3.1.2

ROUTE 441 SITE
CHARACTERISTICS AND PROPERTIES OF SOILS

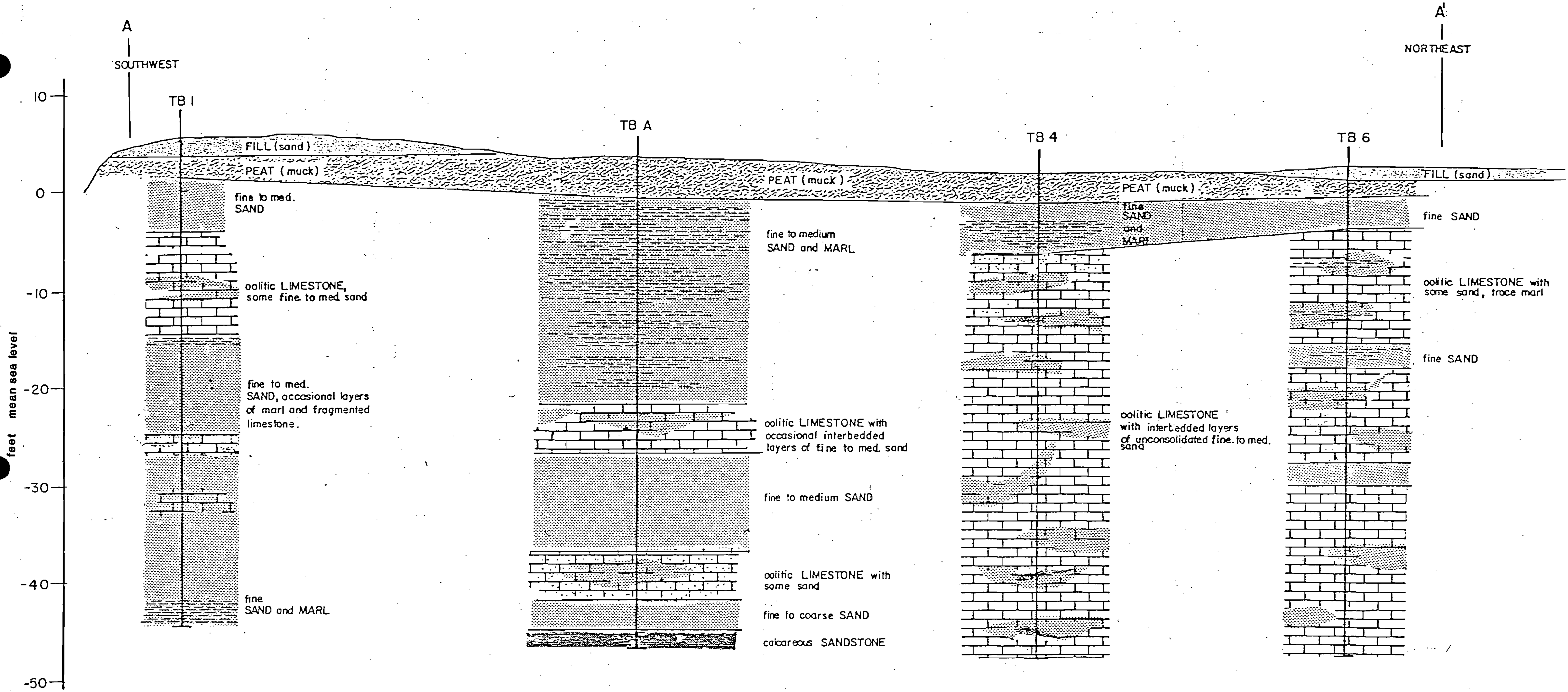
Mapping[1] Unit Symbol	Name[1]	Texture[1,2]	Drainage[1,2] Class	Slope[1,2] (Percent)	Perme-[1,2] ability (in/hr)
La	Lauderhill muck	Muck over occasional sand	Poorly drained	0-3	6-20
Ma	Margate fine sand	Fine sand over limestone	Poorly drained	0-3	6-20
Ok	Okeelanta muck	Muck over fine sand	Poorly drained	0-3	6-20
Pm	Plantation muck	Muck over fine sand	Poorly drained	0-3	6-20
Un, Uo, Ur	Udorthents	Variable	20-60 inches to water	2-40	-

Notes:

1. Date obtained from Soil Survey of Broward County Area, Florida, U.S.D.A. Soil Conservation Service.

2. Data obtained/verified during site visits and/or test borings.

FIGURE 2.3.1.7



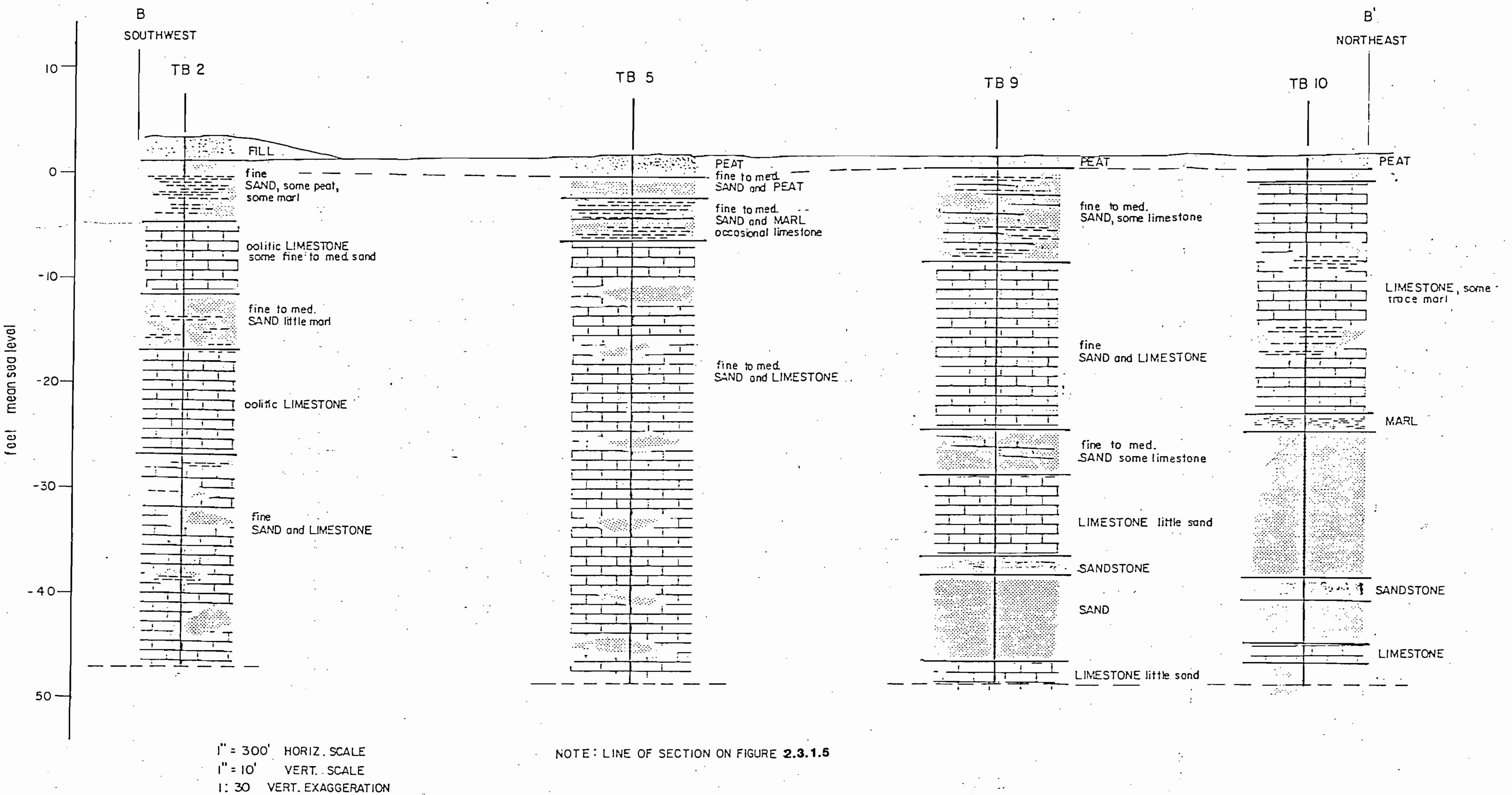
1"= 300' HORIZONTAL SCALE
1"= 10' VERTICAL SCALE
1:30 VERT. EXAGGERATION

NOTE:
LINE OF SECTION SHOWN ON FIGURE 2.3.1.5

BROWARD COUNTY

RESOURCE RECOVERY
HYDROGEOLOGIC INVESTIGATION
ROUTE 441 SITE
GEOLOGIC CROSS SECTION A-A

FIGURE 2.3.1.8



BROWARD COUNTY

RESOURCE RECOVERY
HYDROGEOLOGIC INVESTIGATION
ROUTE 441 SITE
GEOLOGIC CROSS SECTION B-B

fine unconsolidated calcareous sand and marl with the thickest portion of this layer occurring at the south end of the site with a thinning trend, and occasional pinching out towards the north end of the site. This sandy layer overlies a very loose, porous, and quartz sandy oolitic limestone which is poorly cemented and very weathered at various depths with isolated layers of fine to medium sand and shell fragments throughout.

2.3.1.3 Geologic Maps

In general, uniform geologic conditions, typical of the Broward County area, prevail throughout the site.

Fifty foot test wells were drilled throughout the landfill areas. The material below the muck consisted mainly of very porous limestone with sand filling in the pores. There were a few sand layers with a fraction of marl but no continuous confining layer. A few lenses were discovered at various depths. The closest confining layer would be the layer below the Biscayne Aquifer, which consists of marl and lime clay. Above that the ground is open and the water is uncontained.

Detailed geotechnical reports are provided in Appendix 10.8. Figures 2.3.1.7 and 2.3.1.8 show geological sections of the project site.

2.3.1.4 Bearing Strength

Of the four firms which performed geotechnical studies at the Project site (as outlined in Subsection 2.3.1.2) two of them, KBC Consultants and Florida Testing and Engineering, gave specific recommendations for foundation design, foundation construction and geotechnical site preparation considering the in-situ geologic conditions encountered. These recommendations are provided along with the geotechnical reports in Appendix 10.8.

It is the general concensus of these two firms that the soils and lithology encountered on the site are typical of the Broward County area and that with proper site preparation and foundation design, soil bearing strength should not be considered a significant factor for foundation suitability. In general foundation design considerations include the following:

- o Removal of the surface strata of muck and sandy marl and replacement with select fill. This would allow for shallow foundation design (slab, footings) supported by the native limestone formation providing a bearing value of 2,500 to 3,000 pounds per square foot.

- o By-pass the surface soils with a deep pile system.

Since construction details will not become available until after vendor selection definitive recommendations are not being made at this time. In general, however, potentially limiting conditions, i.e. the existence of highly compressible surface soils, can be overcome by appropriate site preparation and foundation design.

2.3.2 Subsurface Hydrology

This section contains two subsections which describe the physical, chemical, and hydrological characteristics of subsurface waters that have potential to be affected by the construction or operation of the proposed plant, residue/unprocessable waste landfill, and associated facilities. Even though facility construction and operations will not have an effect on subsurface 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 source aquifer for the potable water supply in Broward County) has made it necessary to perform detailed aquifer analyses for proper facility design.

2.3.2.1 Subsurface Hydrologic Data for the Site

Highly permeable limestones and sandstones, and overlying younger deposits of sand are the geologic units of particular importance to groundwater conditions in the area which constitute the Biscayne Aquifer system. The thickness of the unconfined Biscayne Aquifer is more than 200 feet in coastal Broward County. 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). Due to the separation between the Biscayne and Floridan Aquifers, the Floridan Aquifer will not be considered further.

Aquifer pumping tests have been conducted at the Fort Lauderdale Dixie Well Field which is located approximately one mile north of the Route 441 Site. The test data indicated a transmissivity of 1.2×10^6 gallons per day per foot (gpd/ft). 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 Aquifer range from 4.0×10^5 gpd/ft in northern Broward County to 2.5×10^6 in southern Broward County. The lower range in transmissivities reflect a decrease in the permeability of the consolidated section of the aquifer due to increased sand content in the limestone beds (porosity decrease). No storage coefficients have been reported for the Ft. Lauderdale area. However, an apparent storage coefficient of approximately 0.015 was reported for the Prospect Well Field.

Water levels in the Biscayne Aquifer fluctuate in response to recharge and discharge and are influenced to some extent by tidal fluctuations. Figure 2.3.2.1 exhibits typical water level extremes in the northern part of the Dixie well field. Maximum water levels usually occur in October and minimum levels in April and May. The average difference between maximum and minimum water levels is ±4 feet. Annual fluctuations of water levels at the three largest well fields

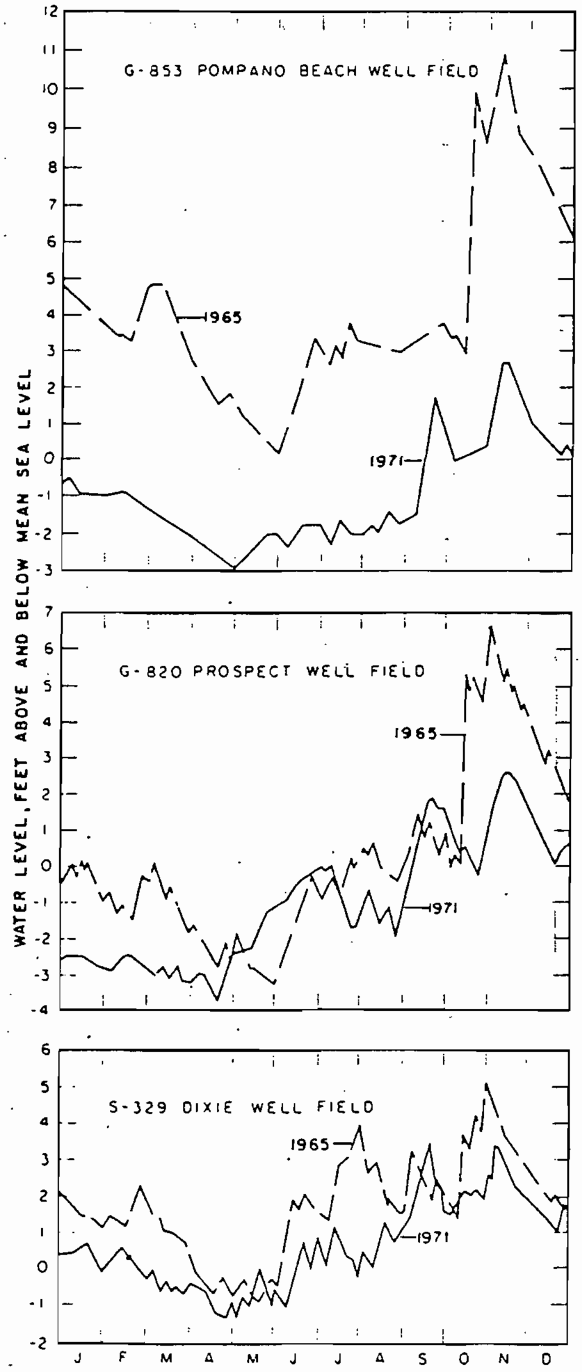
(Pompano, Prospect, and Dixie) for a dry year (1971) and a wet year (1965) are shown on Figure 2.3.2.2. Water level declines are most pronounced in the first five months of the year when recharge is minimal and discharges from the well fields are maximum. Water levels rise from June through October because 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) were as much as 14 feet.

From an examination of available water level contour maps it appears that the water table gradient is in a general south/southeast direction, except near the coast where it is seaward. The most recent water level contour map (Figure 2.3.2.3), compiled by the USGS, indicates that ground water flow is in a general easterly direction in the vicinity of the Route 441 site. (Note this map probably represents ground water flow conditions within the medium to deeper portions of the Biscayne Aquifer.) The Dixie Well Field pumpage has caused a cone of depression north of the site and a water level divide just south of the well field.

Site-Specific

The thickness of the unsaturated zone varies very little across the site except along the perimeter where the site has been artificially built-up for road construction and various structures. The unsaturated zone ranges from less than a foot in the low lying areas up to 4 or 5 feet in thickness along the perimeter of the site. It should be pointed out that the water level measurements were taken from January 1984 (beginning of the dry season) through March 1984. During this period water levels declined about 0.5 feet on the average.

These water level measurements were used to construct a water level contour map that depicts shallow ground water flow conditions at the site. Shallow ground water flow



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

ANNUAL FLUCTUATIONS OF WATER LEVELS
AT THREE LARGE WELL FIELDS
IN BROWARD COUNTY

FIGURE 2.3.2.3

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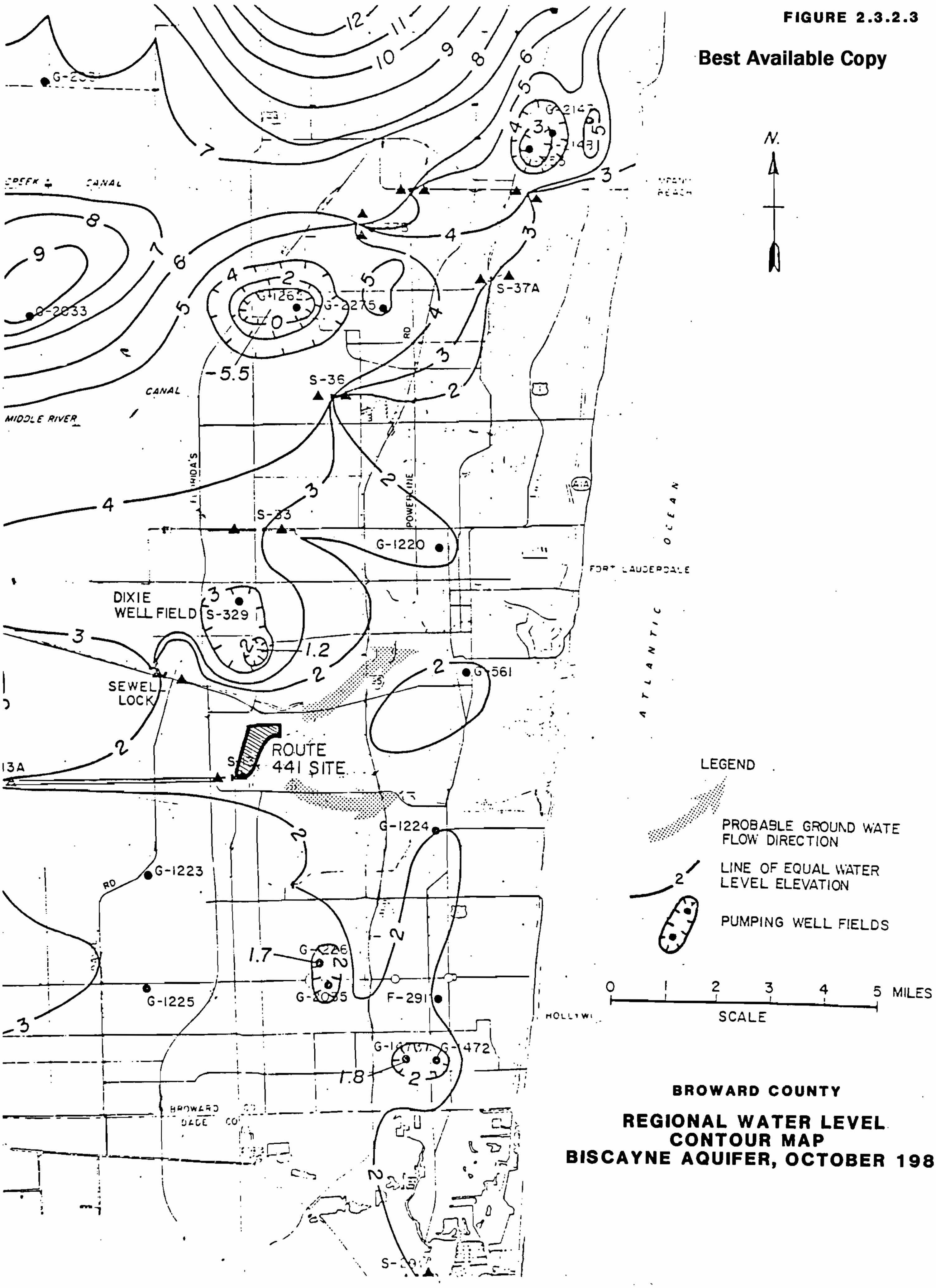


BROWARD COUNTY

REGIONAL WATER LEVEL CONTOUR MAP BISCAYNE AQUIFER, OCTOBER 1983

is in a south to southeast direction and under a very low hydraulic gradient (toward the South Fork New River Canal) as shown on Figure 2.3.2.4. Table 2.3.2.1 provides water level and measuring point elevations referenced to mean sea level.

An estimate of the upper zone permeability for the site was determined by the use of slug injection tests on Piezometers 1 and 12, and short term pumping tests on permanent monitoring wells.

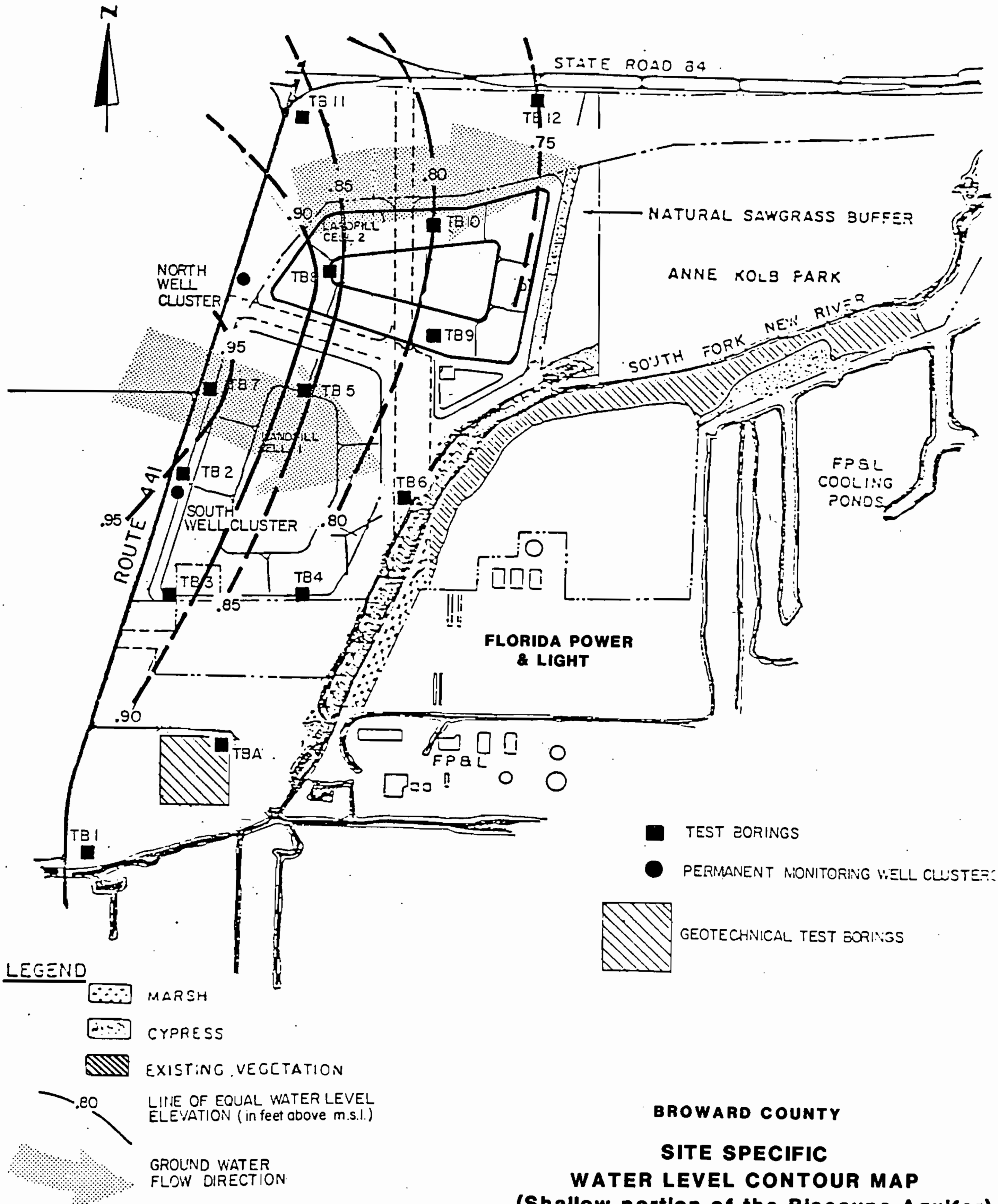
The slug injection test involves the (instantaneous) injection of a known volume of water into a well; calculation of the values of residual head(s) and reciprocal of time (1/tm) and a plot of corresponding values of (s) and 1/tm on rectangular coordinate graph paper. The plotted values should define a straight line through the origin; finally, transmissivity can be calculated from the coordinate of any point on the straight line. As a supplement to the slug injection tests, short-term pumping tests were performed on the monitoring wells.

An estimated range of permeability coefficients on the order of 10^{-3} cm/sec to 10^{-4} cm/sec has been determined from the data collected during these tests. The actual permeability of the sand and occasional limestone and marl lenses could vary widely in both directions from the aforementioned values.

Ground Water Quality Conditions

The Route 441 Site overlies the Biscayne Aquifer, and the available information suggest that the fresh water/brackish water interface underlies the site, probably in the lower portion of the aquifer. The 1,000 mg/L (brackish) isochlor for the 1983 dry season is shown on Figure 2.3.2.5.

This is substantiated in part by chloride data for Wells G1236 and Well S830. Well G1236, which is located at the western boundary of the site and screened at about 200 feet, showed chloride concentrations on the order of 980 mg/L.



BROWARD COUNTY

SITE SPECIFIC
WATER LEVEL CONTOUR MAP
(Shallow portion of the Biscayne Aquifer)

TABLE 2.3.2.1

GROUND WATER ELEVATIONS IN PIEZOMETERS
ROUTE 441 SITE, BROWARD COUNTY, FLORIDA

Boring Number	Elevation of Boring (ft. Above MSL, Ground Surface)	Ground Water Elevation (ft. above MSL)
TB 1	5.4	0.93
TB 2	3.2	0.93
TB 3	1.4	0.89
TB 4 (1)	1.4	-
TB 5	1.5	0.85
TB 6 (1)	-	-
TB 7	4.4	0.97
TB 8	1.9	0.90
TB 9	1.6	0.78
TB 10	1.4	0.81
TB 11	1.7	0.86
TB 12	4.7	0.75

Note:
1. No water levels obtained. Piezometers TB-4 and TB-6 destroyed.

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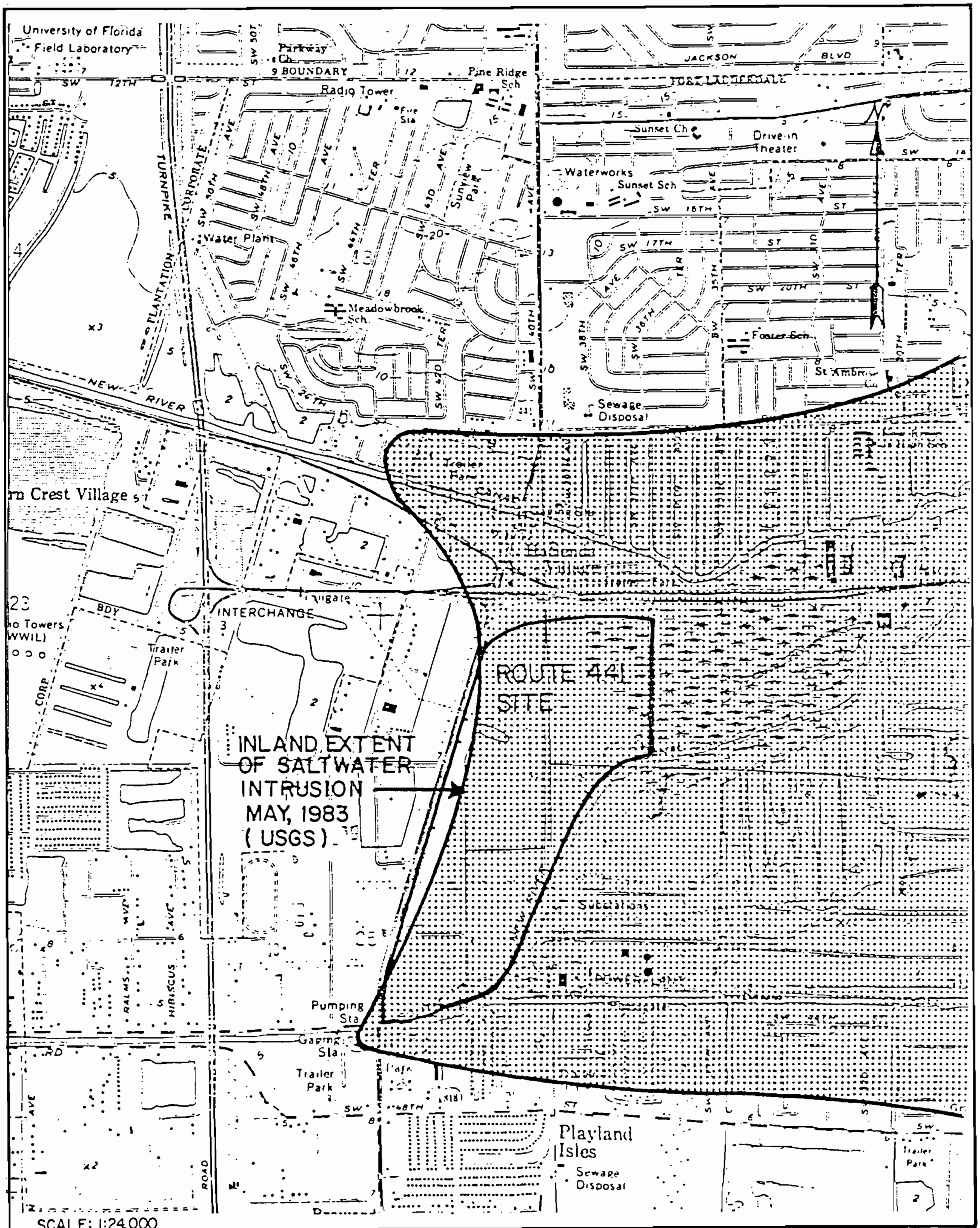

BROWARD COUNTY
RESOURCE RECOVERY
ROUTE 441 SITE
1,000mg/l ISOCHLOR
FOR BISCAYNE AQUIFER

Well S830, which is located on the Florida Power and Light Company property (southeast of the site), is screened at about 130 feet and showed chloride concentrations in the range of 1,000 to 3,500 mg/L.

This information strongly suggests that the fresh/brackish water interface lies between these two wells and runs through the site. Based on this information, it would appear that significant development of the Biscayne Aquifer to the east of the site would be constrained as a result of natural water quality conditions. Additionally, any plans for increased pumpage/expansion of existing well fields north and west of the site would have to address the potential for brackish water intrusion.

The Dixie Well Field is by far the largest well field within proximity to the site (Figure 2.3.2.6). Figure 2.3.2.7 shows trends in the overall water quality of the Dixie Well Field raw pumpage from 1963 to 1978. The concentrations of total dissolved solids, total hardness, total alkalinity, calcium, magnesium and iron are representative of carbonate waters. All these levels tend to remain stable with a slight rise for selected constituents during the mid 1970's.

The proximity of the Dixie Well Field to the fresh water/brackish water interface was of enough concern to warrant the installation of monitoring wells to the south and east for chloride monitoring (Figure 2.3.2.6). Chloride data from some of these wells are shown on Figures 2.3.2.8 and 2.3.2.9. Chloride levels appear have been fairly stable in all of these observation wells between 1975 and 1979.

Chloride data are available for well S-862, a private supply well immediately north of the site, from 1948 to 1966 (Table 2.3.2.2). Although construction details are not available for this well, the data suggest that the brackish water/fresh water interface may have moved slightly northward during these years.

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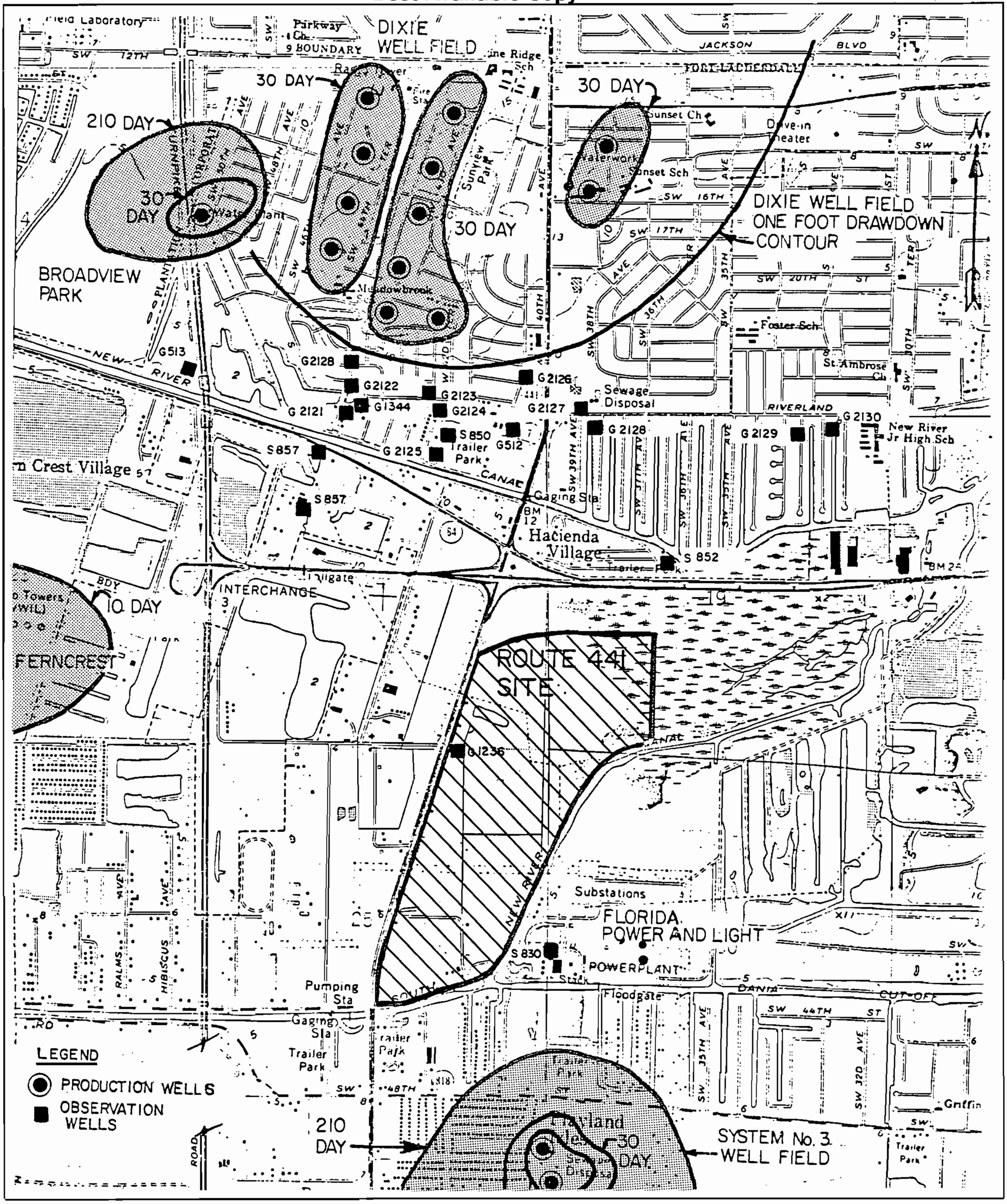
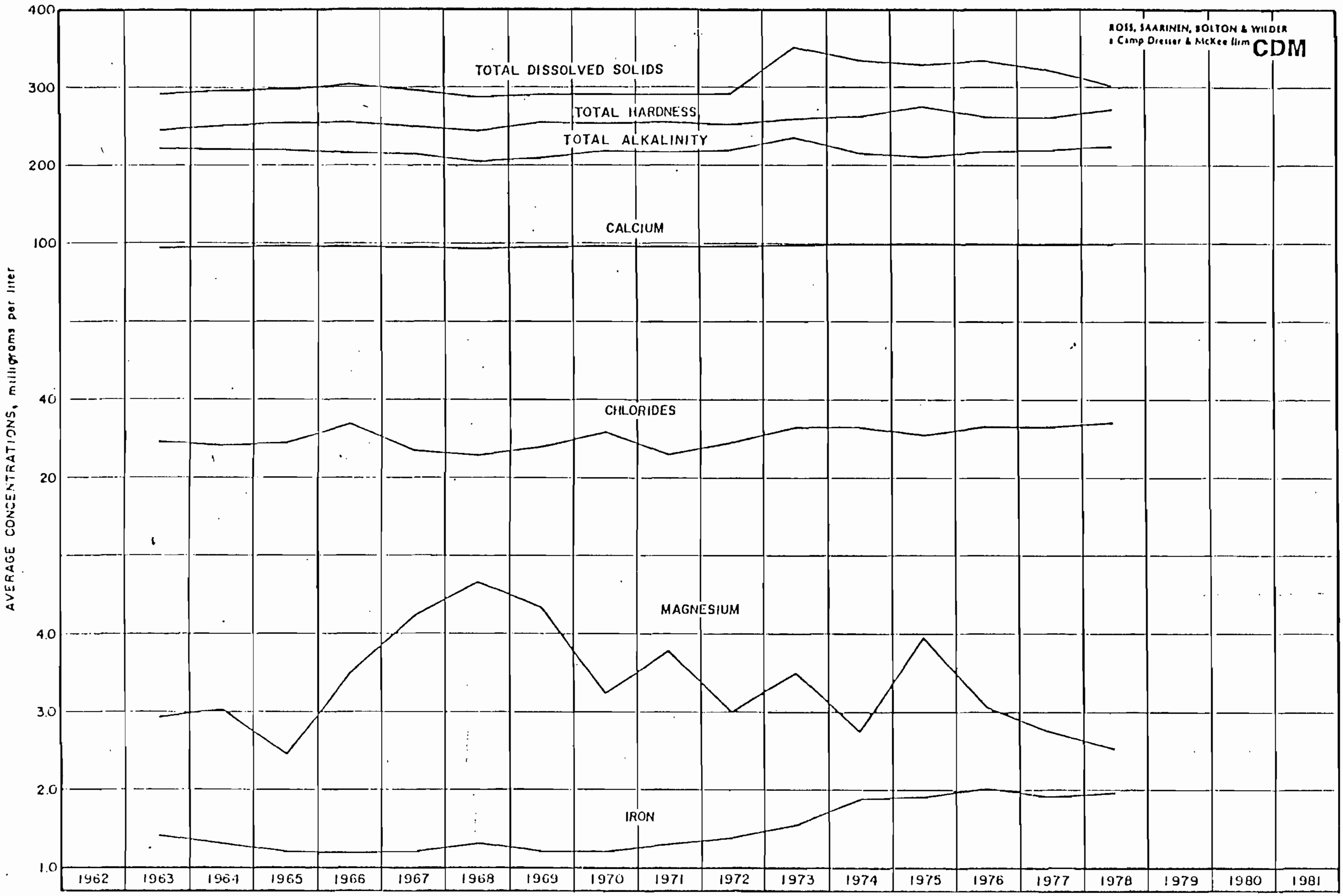
FIGURE 2.3.2.6



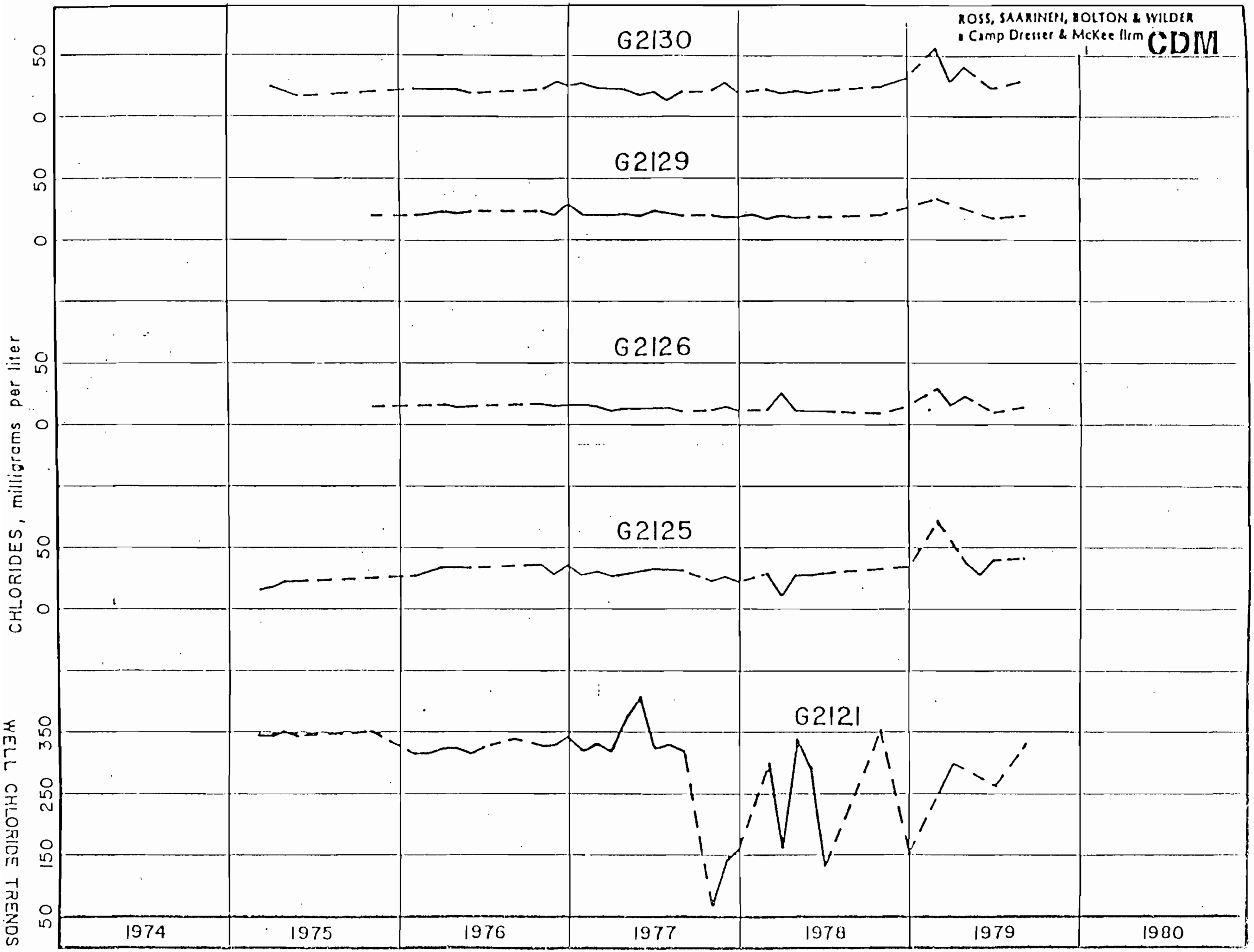
BROWARD COUNTY

RESOURCE RECOVERY
ROUTE 441 SITE
LOCATIONS OF MAJOR WELL FIELDS
AND MONITORING WELLS



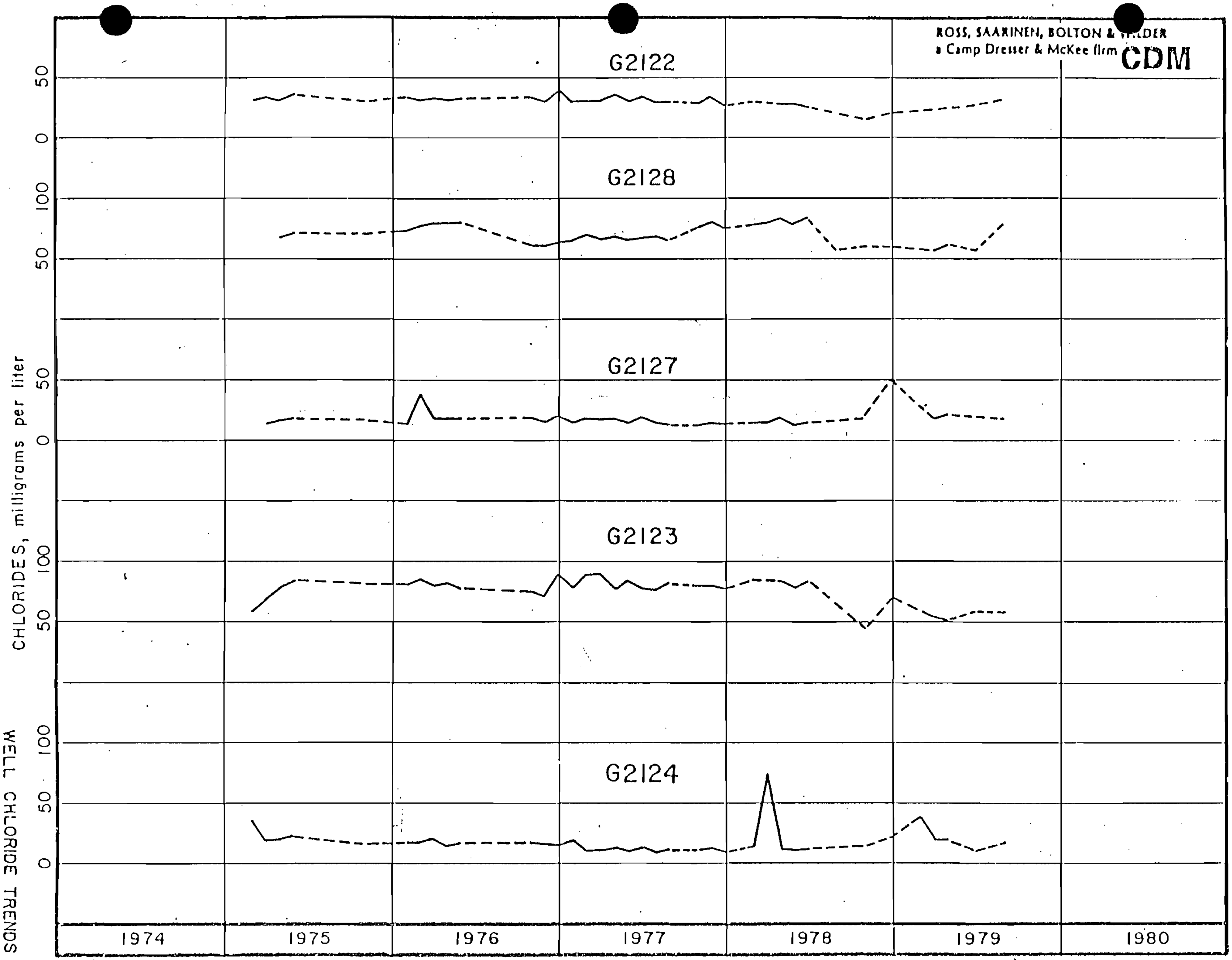
AVERAGE DIXIE WELL
WATER QUALITY

FIGURE 2.3.2.7



WELL CHLORIDE TRENDS

FIGURE 2.3.2.8



WELL CHLORIDE TRENDS

FIGURE 2.3.2.9

TABLE 2.3.2.2

HISTORIC CHLORIDE CONCENTRATIONS
IN GROUND WATER FROM WELL S-862

Date	Concentration	Date	Concentration
10-22-46	103	9-15-52	59
10-25-46	82	12-15-52	16
1-20-47	60	3-24-53	14
4- 7-47	236	6-25-53	16
5- 7-47	89	12-22-53	23
6-24-47	95	3-25-54	24
7-16-47	37	6-24-54	15
1-16-48	204	9- 2-55	27
2-26-48	45	3- 2-56	38
3-16-48	65	6-19-56	32
4-22-48	38	11-20-56	43
6-17-48	26	2-15-57	76
8-18-48	27	7-19-57	39
10-21-48	104	11-15-57	28
12-14-48	47	4-28-58	30
2-16-49	21	12-19-58	66
4-14-49	24	5- 6-59	127
6-15-49	26	3-30-60	15
8-16-49	20	6-27-60	18
10-17-49	19	9- 6-60	25
12-13-49	20	12-15-60	14
3-23-50	19	4-20-61	15
6-15-50	22	8- 3-61	18
11- 8-50	21	12-12-61	20
2-19-51	23	3-14-62	34
5-22-51	69	6- 1-62	46
8- 8-51	17	1-24-63	88
11-15-51	15	5- 6-63	114
2-12-52	18	8- 8-63	130
6-11-52	16	5-25-64	170
		10-20-64	151
		4- 6-66	236

Site-Specific

Prior to the collection of ground water samples for a chemical analysis, a sampling protocol and list of chemical parameters to be analyzed were submitted to the Florida DER for their approval. After concurrence by the DER with the proposed sampling program, water samples were collected from the newly installed monitoring wells at the Route 441 Site on March 9, 1984. The results of the laboratory analyses are presented in Table 2.3.2.3. The constituents were analyzed for indicators of landfill 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 detection limits. These data represent upgradient (background) water quality conditions.

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 sources in the project area which have potential to be impacted by project implementation are the Biscayne aquifer and the South Fork of the New River Canal (C-11 Canal). In the project area, 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 flow to canals and other

TABLE 2.3.2.3

GROUND WATER QUALITY AT THE ROUTE 441 SITE
BROWARD COUNTY, FLORIDA, MARCH 1984

Parameter	North Well Cluster Deep	North Well Cluster Shallow	South Well Cluster Deep	South Well Cluster Shallow
Total Organic Carbon (TOC)	19	14	19	17
Chemical Oxygen Demand (COD)	268	224	72	80
pH (Std. Units)	7.6	7.2	7.1	7.2
Specific Conductance (umhos)	450	440	482	462
Nitrate-N	<0.1	<0.1	<0.1	<0.1
Sulfate	11	12	<1	2
Chloride	63	35	67	63
Sodium	66	74	78	63
Potassium	1.7	1.9	3.9	4.6
Magnesium	13	9.5	30	4.6
Calcium	120	280	120	96
Ammonia	<0.1	<0.1	0.17	0.56
Bicarbonate (as HCO_3)	292.8	1482.3	683.2	671.0
Total Alkalinity	240	1215	560	550
Iron	10.76	1.72	7.88	0.18
Manganese	0.18	0.09	0.24	<0.05
Arsenic	0.005	0.016	0.014	0.015
Beryllium	<0.001	<0.001	<0.001	<0.001

TABLE 2.3.2.3

GROUND WATER QUALITY AT THE ROUTE 441 SITE
BROWARD COUNTY, FLORIDA, MARCH 1984[1]
(continued)

	North Well Cluster		South Well Cluster	
Parameter	Deep	Shallow	Deep	Shallow
Cadmium	<0.01	<0.01	<0.01	<0.01
Total Chromium	<0.05	<0.05	<0.05	<0.05
Copper	<0.05	<0.05	<0.05	<0.05
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	0.016	0.0011	0.177

Note:
1. All units in milligrams per liter (mg/L) unless given.

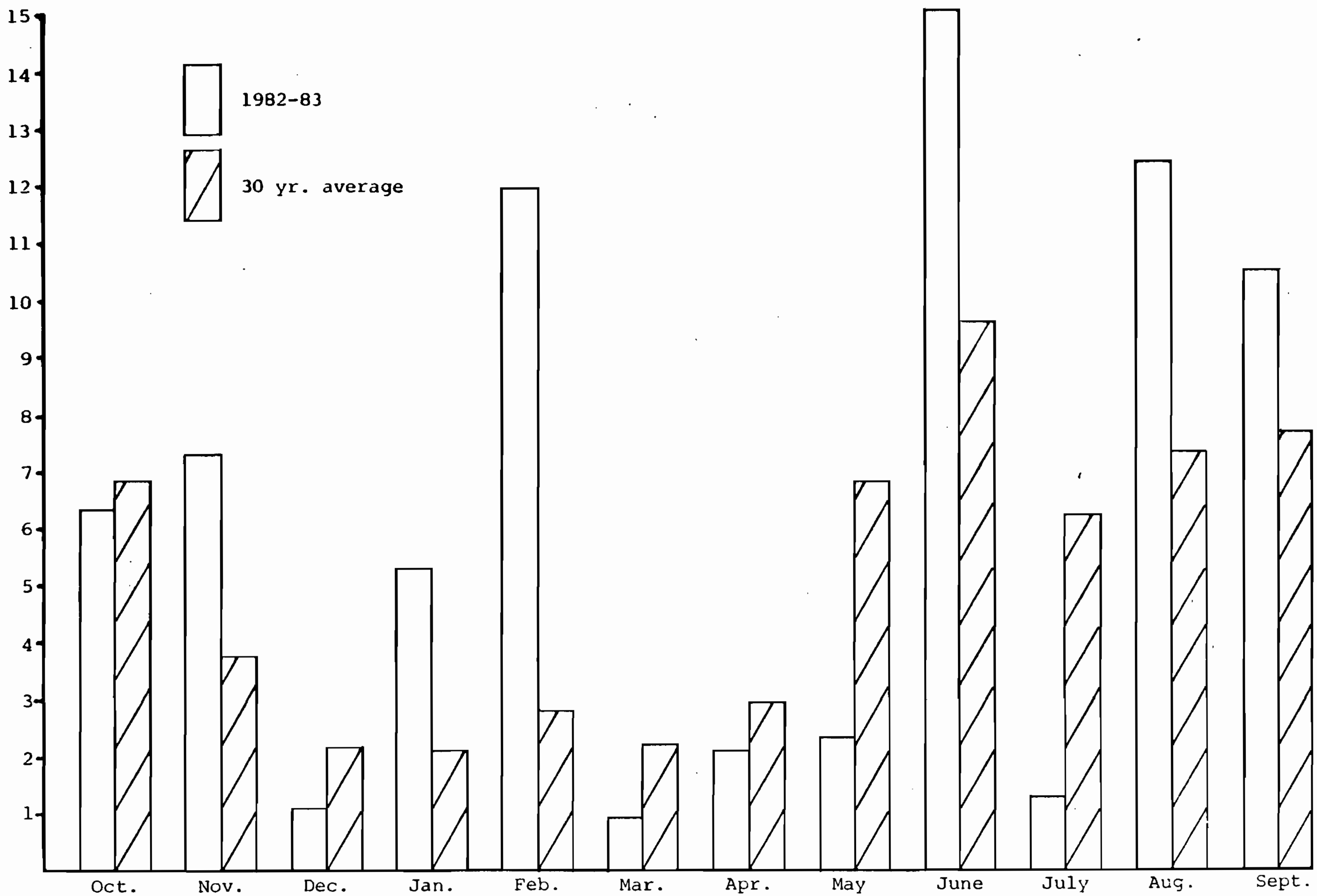
surface water bodies (greatest during rainy season) and by pumping from wells (greatest during the dry season). The average annual rainfall is approximately 60 inches; approximately 70 percent of the total recharge from rainfall occurs in the period June through October. Figure 2.3.3.1 provides the total (1982-83) and average monthly rainfall data in the vicinity of the project site. Based on previous studies about 40 inches infiltrates to the water table. About 50 percent (20 inches) of the average annual rainfall which infiltrates to the water table is lost from the aquifer by evapotranspiration. The remaining 50 percent (20 inches) is available to flow toward wells and canals. Figure 2.3.3.2 provides a diagrammatic portrayal of recharge to and discharge from the Biscayne aquifer in Broward County. Average temperatures range from about 82° Fahrenheit in the summer to about 68° 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:

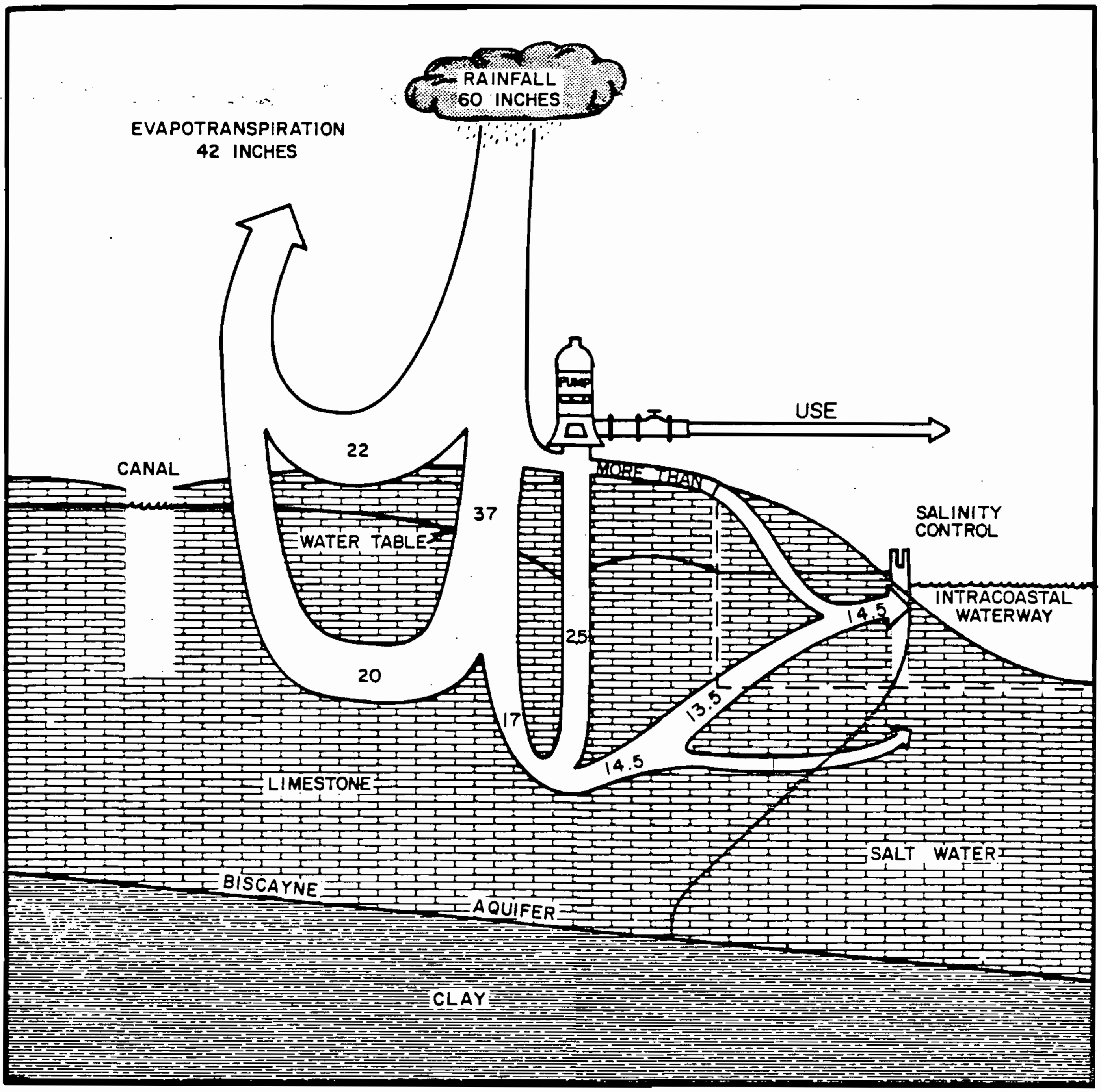
Class I - Potable Water Supply
Class II - Shellfish Propagation or Harvesting
Class III - Recreation, Propagation and Management of Fish and Wildlife
Class IV - Agricultural Water Supplies
Class V - Navigation, Utility and Industrial

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 (F.A.C. 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.



TOTAL MONTHLY PRECIPITATION, INCHES FT. LAUDERDALE, FL

FIGURE 2.3.3.1



SOURCE: FACILITY PLAN ON WASTEWATER MANAGEMENT SYSTEMS FOR BROWARD COUNTY, FLORIDA, 1978

BROWARD COUNTY

DIAGRAMMATIC PORTRAYAL OF RECHARGE TO AND DISCHARGE FROM THE AQUIFER IN BROWARD COUNTY

The source of all potable water in Broward County is groundwater from the Biscayne Aquifer. This Aquifer has been designated as the sole source of drinking water for the area by U.S.E.P.A. Figure 2.3.3.3 depicts the existing areas of influence of the major wellfields in the County within a five mile radius of the project site as provided by the Broward County Department of Public Works, Division of Water Resource Management.

2.3.3.3 Well Inventory

An inventory was made of production wells and monitoring wells within 1 to 1.5 miles of the proposed southern resource recovery facility and unprocessable/ash residue landfill site. The inventory was conducted through personal visits and discussions with representatives of the United States Geological Survey (USGS) in Miami, the South Florida Water Management District in West Palm Beach, the Broward County Water Resource Management Division and the Environmental Quality Control Board, and from existing reports such as Camp, Dresser and McKee's Dixie Well Field Stress Analsyis, 1980.

From our review of the available information, there are four major well fields within 1.5 miles of the site boundaries:

	Number of Wells	Estimated Pumpage
1. Dixie Well Field	±26	13 mgd
2. Ferncrest Well Field	3	1 mgd
3. Broadview Park Well Field	3	1 mgd
4. Broward County Department of Utilities System No. 3	3	2 mgd

Additionally, Florida Power and Light, Company operates a production well southeast of the site. The locations of the major well fields and USGS monitoring wells are shown on Figure 2.3.2.6.

City of Fort Lauderdale's Dixie Well Field is by far the largest well field in proximity to the site. Four of the two dozen production wells within the Dixie Well Field are located

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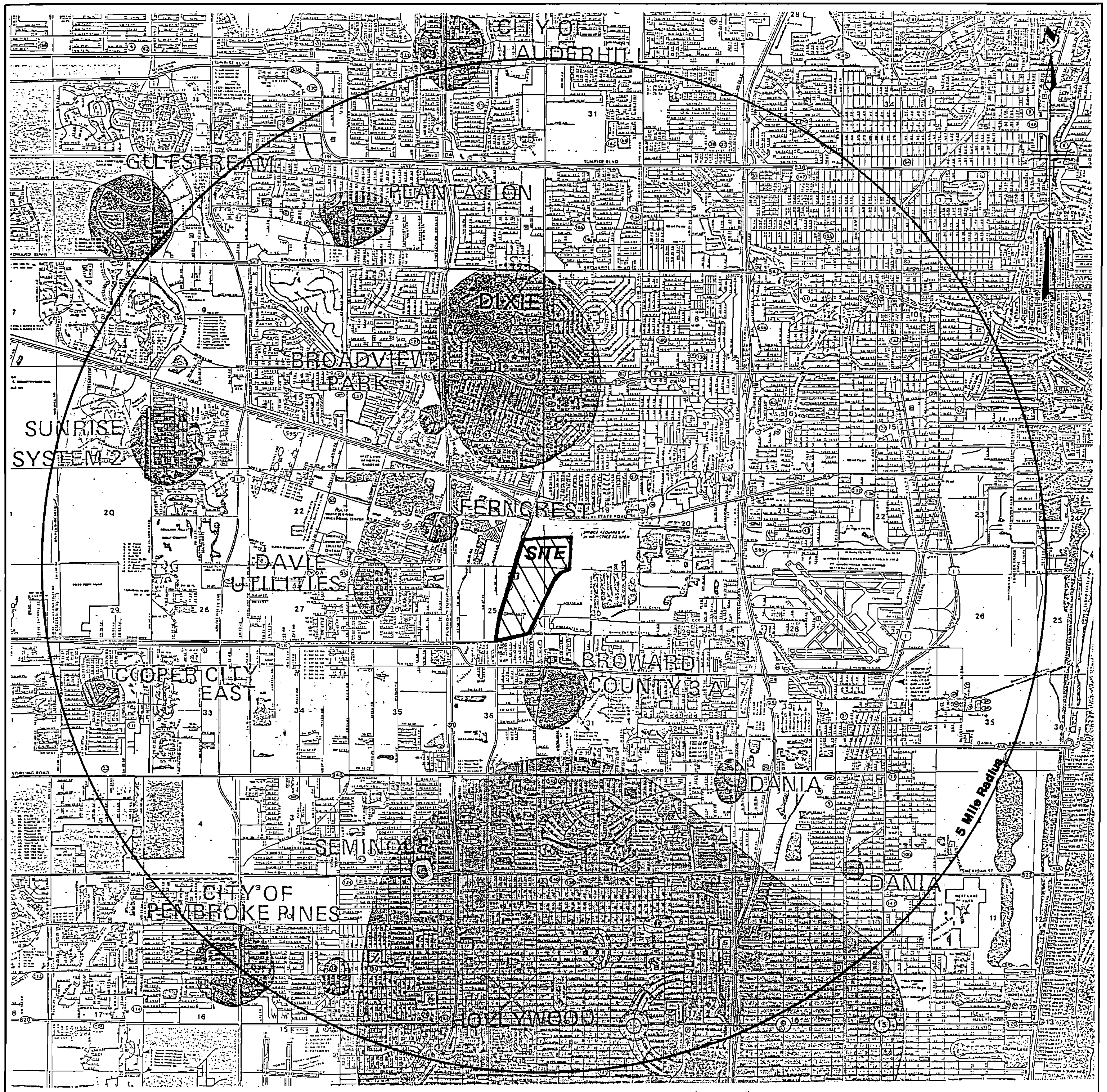
FIGURE 2.3.3.3



SOURCE: Department of Public Works, Division of Water Resource Management: Water Supply Assurance Program (8/16/84).

LEGEND

Existing Wellfield Zone of Influence

SCALE:

0 1 2 3 4 5

MILES

BROWARD COUNTY

EXISTING WELLFIELD ZONES OF INFLUENCE

within one mile of the northern site boundary and an additional 12 wells are within 1½ miles of the northern site boundary (Figure 2.3.2.6). A typical Dixie Well was constructed in the 1940s with casing to 100 feet, 12-inch diameter open hole to 125 feet and a capacity of about 500 gpm. Construction details are provided in Table 2.3.3.1.

To the south, Broward County Utilities Division System No. 3 Well Field has three wells within one mile of the site (Figure 2.3.2.6). These wells are generally cased to 60 feet and open hole to 70 feet below grade with well capacities of about 600 gpm.

Ferncrest Utilities, which supplies an area immediately to the west of the site, has three active closely spaced production wells within 1 to 1.5 miles of the western site boundary. These wells are cased to about 80 feet and have a combined capacity of about 1500 gpm.

The Broadview Park Water Company Well Field is located 1 to 1.5 miles northwest of the site and immediately west of the Dixie Well Field. The magnitude of Broadview Park pumpage is comparable to that of Ferncrest.

Florida Power and Light Company, immediately to the southeast of the site, pumps about 250 gpm for a steam electrical plant.

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 translated into travel time contours to the major pumping centers and 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., Dixie Well Field) a one-foot drawdown contour was also plotted.

TABLE 2.3.3.1

DIXIE WELL CONSTRUCTION DETAILS

Well No.	Depth (feet)	Cased (feet)	Open Hole (feet)	Inside Diameter (inches)	Drilled (year)	Well Capacity (gpm)
2	125	110	15	12	1926	600
3	125	110	15	12	1926	600
4	125	110	15	12	1926	600
5	99	87	12	12	1971	600
6	189	181	7	12	1971	600
7	125	110	15	12	1940	600
8	104	89	15	12	1971	600
9	125	110	15	12	1945	600
10	148	82	66	12	1945	600
11	126	110	16	10	1926	600
12	126	110	16	12	1926	600
13	125	110	15	12	1947	400
14	125	110	15	12	1947	400
15	125	110	15	12	1947	400
16	125	110	15	12	1947	400
17	125	110	15	12	1947	400
18	125	110	15	12	1947	400
19	125	110	15	12	1947	400
20	114	89	25	10	1952	500
21	114	87	27	10	1952	500
22	115	89	26	10	1952	500
23	114	87	27	10	1952	500
24	115	89	26	10	1952	500
25	115	89	26	10	1952	500
26	114	89	25	10	1952	500

Cones of depression and travel time contours for the above mentioned well fields are shown on Figure 2.3.2.6. Of significance are the one-foot drawdown contour for the Dixie Well Field and the 210 travel contours for the System No. 3 Well Field and Broadview Park Well Field. Travel time contours were defined only for a 10-day time span at the Ferncrest Well Field.

Based on the information made available to us by the BCEQCB, it appears that the Route 441 site does not lie within a 210-day travel contour or a one-foot drawdown contour for any of the nearby well fields.

The principal water quality concern for all water supply wells near the Route 441 site is the potential for salt water intrusion/upconing. As previously discussed in the Section 2.3.2, the base of the Biscayne Aquifer is brackish/saline in the study area.

Numerous observation wells have been installed southeast of the Dixie Well Field to monitor for salt water intrusion. Many of the "sentry" observation wells are within one mile of the northern site boundary (Figure 2.3.2.6). Also, there is one USGS well at the western boundary of the site and a few others within 1½ miles of the site not directly associated with the Dixie Well Field. Geologic logs for many of the observation wells were presented in Section 2.3. USGS monitoring well details are provided in Table 2.3.3.2.

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 was originally swamp or marsh lands. Upon completion of several drainage projects, Broward County was rendered developable. Drainage areas are exceptionally difficult to

TABLE 2.3.3.2

USGS MONITOR WELLS

Well Number	Well Depth[a/]	Casing Depth	Beginning of Record	Sampling Frequency
G515	211	N/A[b/]	4/67	Quarterly
S830	118	N/A	5/64	Quarterly
G254	206	N/A	12/65	Quarterly
S857	65	N/A	4/67	Quarterly
S860	40	N/A	4/67	Quarterly
S862	N/A	N/A	4/67	Quarterly
S874	73	N/A	4/68	Quarterly
G1235	212	201	3/64	Quarterly
G1343	210	199	3/68	Quarterly
G1344	182	177	3/68	Quarterly
G2121	185	N/A	5/74	Quarterly
G2122	134	N/A	5/74	Quarterly
G2123	182	N/A	5/74	Quarterly
G2124	111	N/A	5/74	Quarterly
G2125	58	N/A	5/74	Quarterly
G2126	169	N/A	9/75	Quarterly
G2127	190	N/A	3/75	Quarterly
G2128	61	N/A	4/75	Quarterly
G2129	177	N/A	10/75	Quarterly
G2130	60	N/A	3/75	Quarterly

a/ Feet below ground

b/ Not available

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 located east and downstream of the SFWMD C-11 east drainage basin. It is generally a flat low lying area with ground elevations typically ranging from 0.0 to 2.0 feet, NGVD. There is an existing berm along the C-11 canal adjacent to the site which was created from spoil material when the canal was dredged. Site drainage can be characterized as ponding in low areas. Any overland discharge of runoff would be to the C-11 canal.

Water levels in the C-11 canal adjacent to the property, and downstream of SFWMD Pump Station S-13, are basically tidal in origin and typically range on an annual basis between -1.64 ft., NGVD (flood tide) and elevation -0.02 ft., NGVD (ebb tide). Stages within the canal are at times affected by gate operation and pumping at S-13, and are regulated to provide flood control in upstream reaches as well as to maintain adequate groundwater levels to discourage saltwater migration. Groundwater levels in the area fluctuate during the various seasons in conjunction with precipitation patterns and the operation of Pump Station S-13.

In March 1983, a surface water sampling program was initiated at the site. Sampling was performed by both Hazen & Sawyer, P.C. and GeoTec, Inc. GeoTec was responsible for collecting, transporting and analyzing the grab samples and determining the Dissolved Oxygen (D.O.) concentrations. Hazen and Sawyer supervised the recording and sampling. Hazen and Sawyer was responsible for the correct location and ensuring the samples were taken at the correct depth. A summary of the results of the chemical analysis of the grab samples are listed below. The sampling locations are shown in Figure 2.3.4.1. Actual data for the grab sample analysis is provided in Appendix 10.9.

The sampling program was performed in the following manner:

- The grab samples for locations A, B, C, D, E, F, and G were taken on the third iteration of D.O. measurements, a niskin bottle was used to collect the mid-depth and bottom samples, the surface samples were collected directly.

- For each grab sample, water temperature, stream depth, time and date were recorded.

- GeoTec, Inc. was responsible for recording, transportation, and analysis of all grab samples.

The results of the program can be summarized as follows: Collection and analysis of all the parameters measured were performed in accordance with Methods for Chemical Analysis of Water and Wastes (U.S. Environmental Protection Agency, 1979). All the heavy metals such as copper, mercury, and cadmium were analyzed with Atomic Absorption Spectroscopy (AAS). The nutrients such as Total Kjeldahl Nitrogen (TKN) and total phosphorus were measured with an auto analyzer. The specific conductance and salinity were measured with their corresponding meters which utilize a semi-permeable membrane. The results are listed in Table 2.3.4.1 with all the pertinent information included.

In May 1984, a second sampling program was initiated by Hazen & Sawyer in order to determine bacteriological quality of the surface waters.

During sampling, weather and tide information were recorded. Samples were taken at mid-depth along the river center line at the designated sample stations as shown in

Figure 2.3.4.1. All samples were taken within two (2) hours, stored on ice and then transported to Spectrum Laboratories.

Spectrum Laboratories, Inc. used the Membrane Filter test procedure in accordance with the latest edition of Standard Methods. Colonies were counted and the number per 100 ml was reported for each sampling station. The total and fecal counts data are provided in Table 2.3.4.1.

In addition to the two sampling programs described above, data on surface water quality was obtained from the Broward County Environmental Quality Control Board (BCEQCB). The BCEQCB currently monitors surface water in sixteen rivers and canals plus the Intracoastal Waterway. The sampling program consists of monthly monitoring at 88 separate sites. Water quality parameters tested include: biochemical oxygen demand, total and fecal coliform, fecal streptococcus, phosphorus, nitrogen, temperature, salinity, pH and turbidity. Figure 2.3.4.2 illustrates the location of those monitoring stations relevant to the proposed project site (sample stations 19, 20 and 27). Available BCEQCB river quality data from 1980 is included as part of Appendix 10.9.

In summarizing the water quality data described above and noting the drainage patterns which occur in southern Broward County, the water quality of the South Fork of New River Canal adjacent to the project site is affected by the following sources:

- Freshwater discharge from SFWMD Pump Station S-13 located upstream of the site. The upstream tributary area is the SFWMD C-11 east drainage basin. The SFWMD Pump Station operation is regulated to provide flood control in upstream reaches as well as maintain adequate groundwater elevations to mitigate salt water migration.

- Tidal waters from the New River moving up the reaches of the South Fork. The range of tidal water level variation is between elevation ±1.65 feet (flood tide) and elevation -0.02 feet (ebb tide), relative to mean sea level.

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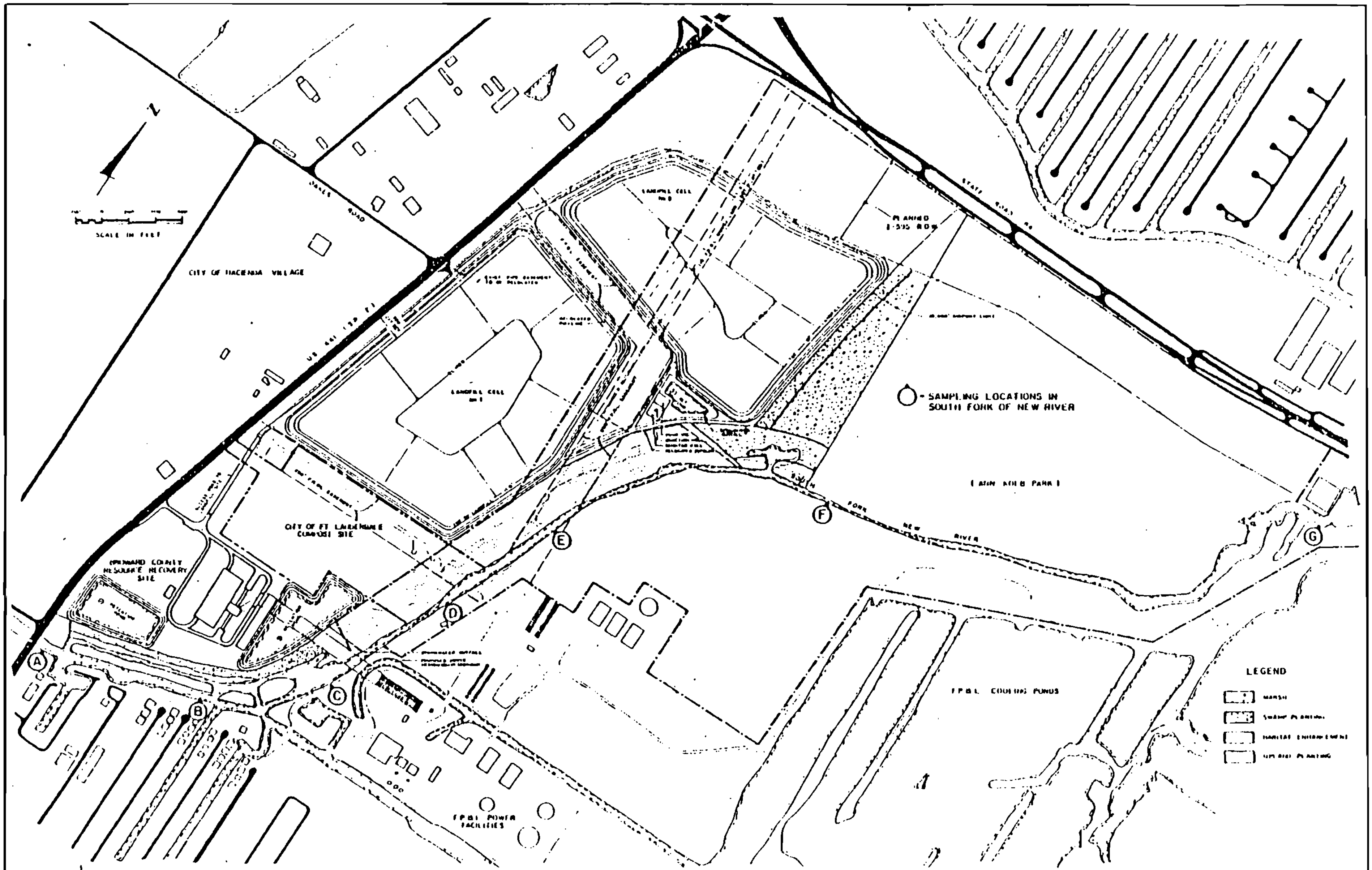
FIGURE 2.3.4.1



HAZEN AND SAWYER ENGINEERS

BOARD OF COUNTY COMMISSIONERS
BROWARD COUNTY, FLORIDA

SOLID WASTE DIVISION
RESOURCE RECOVERY

SOUTH FORK NEW RIVER SAMPLING LOCATION

TABLE 2.3.4.1

SUMMARY OF SOUTH FORK OF NEW RIVER
WATER QUALITY DATA ON MARCH 15, 1984

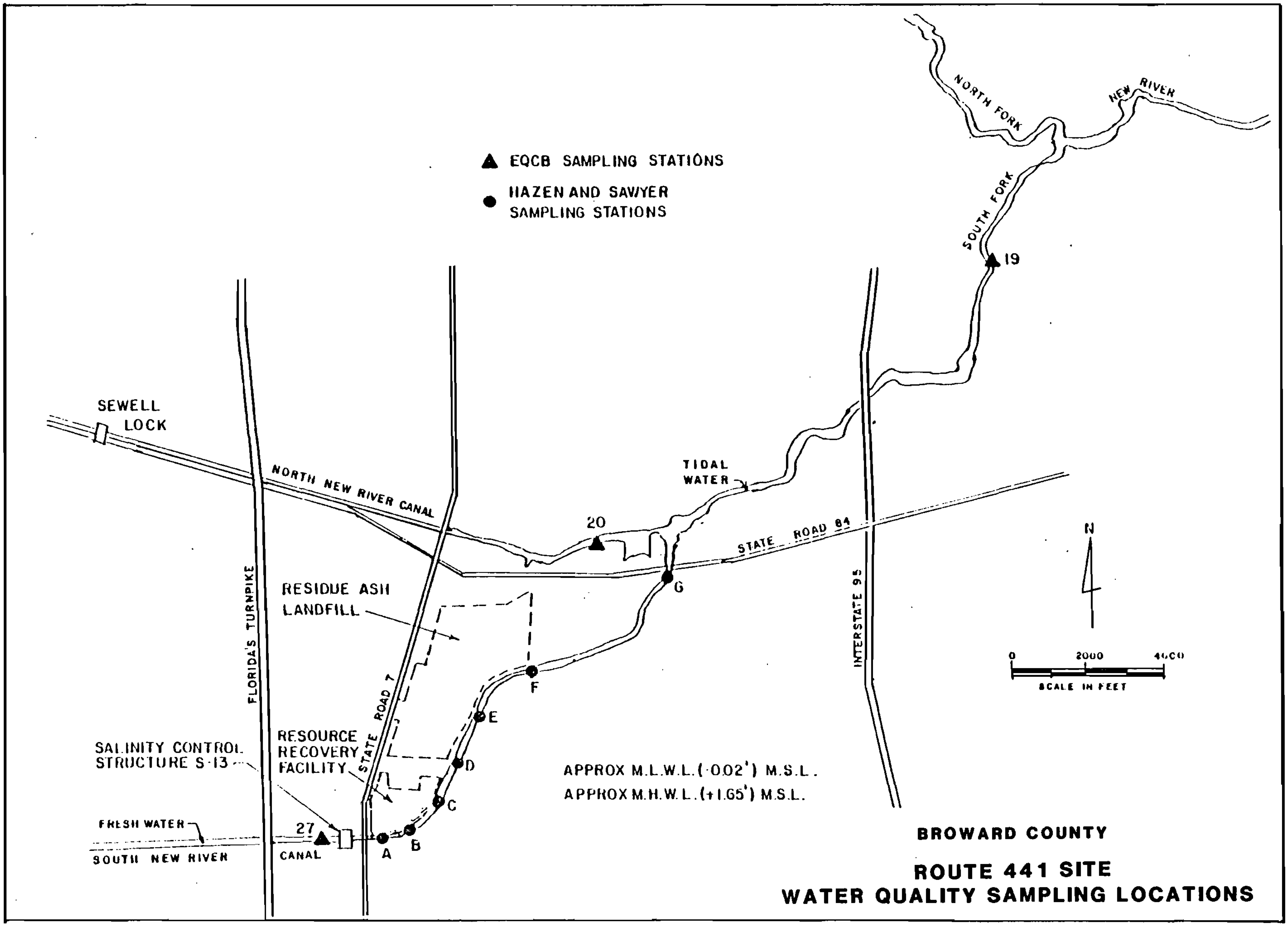
Parameters	Class III Standards	No. of Samples	Typical Values	Range of Values
DO	5.0	149	4.5	2.2 - 6.3
BOD	-	15	4	2 - 11
TSS	-	15	7	4 - 180
Oil & Grease	5.0	15	<1	<1 - 4.0
pH	6.0-8.5	15	6.8	6.6 - 7.1
K. Nitrogen	-	15	2.1	1.8 - 3.7
T. Phosphorus	-	15	2.3	1.4 - 6.7
Lead	0.03	15	0.002	0.01 - 0.06
Zinc	0.03	15	<0.004	<0.004
Mercury	0.002	15	<0.001	<0.001
Copper	0.03	15	0.005	0.003 - 0.02
Cadmium	0.012	15	0.008	0.003 - 0.015
Nitrates	-	15	0.37	0.19 - 0.39
Iron	1.0	15	0.20	0.11 - 3.0
Nickel	0.1	15	<0.006	<0.006
COD	-	15	80	62 - 467

Notes: All values in mg/liter except pH (pH Units).

Higher range of values usually associated with bottom samples where sediment may have been stirred up.

BACTERIOLOGICAL QUALITY ON MAY 2, 1984

	Class III Standards	No. of Samples	Typical Value	Range of Values
Fecal Coliform	800	7	320	70 - 1200
Total Coliform	2400	7	1200	500 - >2000



BROWARD COUNTY

ROUTE 441 SITE
WATER QUALITY SAMPLING LOCATIONS

FIGURE 2.3.4.2

- o Local run-off from adjacent properties. Some developed areas front the river on the south near U.S. 441.

The water quality of the South Fork of New River Canal is typical of that found in the manmade canals in South Florida. The waters are nutrient rich. Sources are run-off (fertilizers) and treated effluent discharges.

2.3.4.2 Measurement Programs

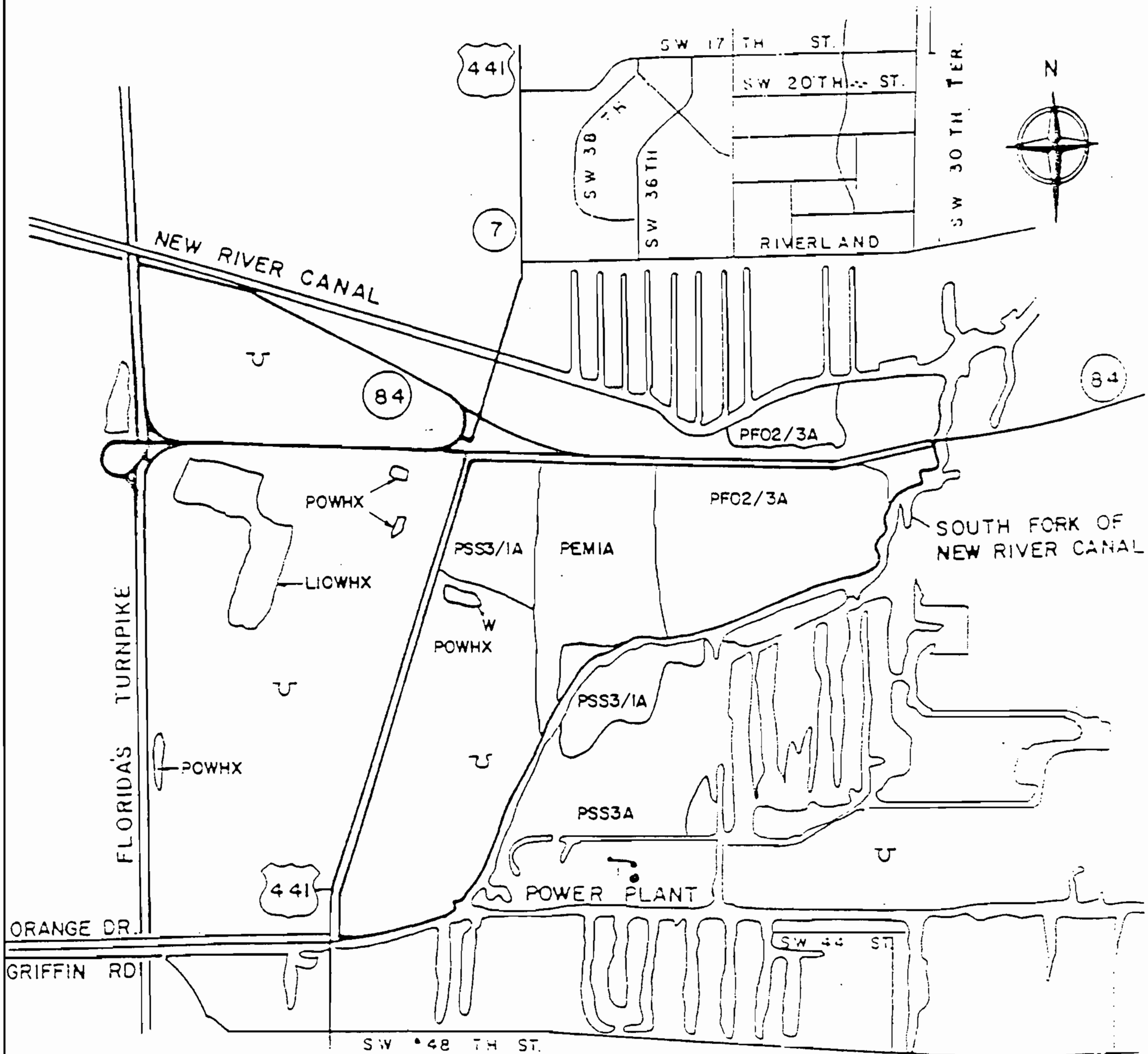
The programs and methods for measuring background physical and chemical parameters of surface waters which have potential of being affected during construction and/or operation of the resource recovery facility and associated landfill have been described in Section 2.3.4.1, Hydrologic Characterization.

2.3.5 Vegetation/Land Use

Much of the site remains covered with natural vegetation. Portions of the site have been identified as wetlands by National Wetlands Inventory mapping (Figure 2.3.5.1). Field studies for this project identified more wetlands than identified on the National Wetlands Inventory mapping (Figure 2.3.5.2), however, the majority of these wetlands have been extensively disturbed. A comprehensive plant species list was developed during the field studies and is presented in Table 2.3.5.1.

2.3.5.1 Wetlands

The wetlands of the site consist of marsh, shrub swamp, wax myrtle pasture, open water, and swamp forest. They have been extensively disturbed. First, when the South Fork New River Canal was dredged, the spoil material was placed adjacent to the river. The spoil bank forms a barrier between New River and the adjacent wetlands; consequently, wetland values have been significantly diminished. In addition, the wetlands have been dissected and isolated by utility corridors. Most



LEGEND

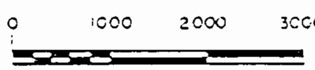
PSS3/IA – PALUSTRINE, BROAD-LEAVED EVERGREEN, BROAD-LEAVED DECIDUOUS SHRUB SWAMP TEMPORARILY FLOODED, NONTIDAL

PEMIA – PALUSTRINE, PERSISTENT EMERGENT VEGETATION, TEMPORARILY FLOODED NONTIDAL

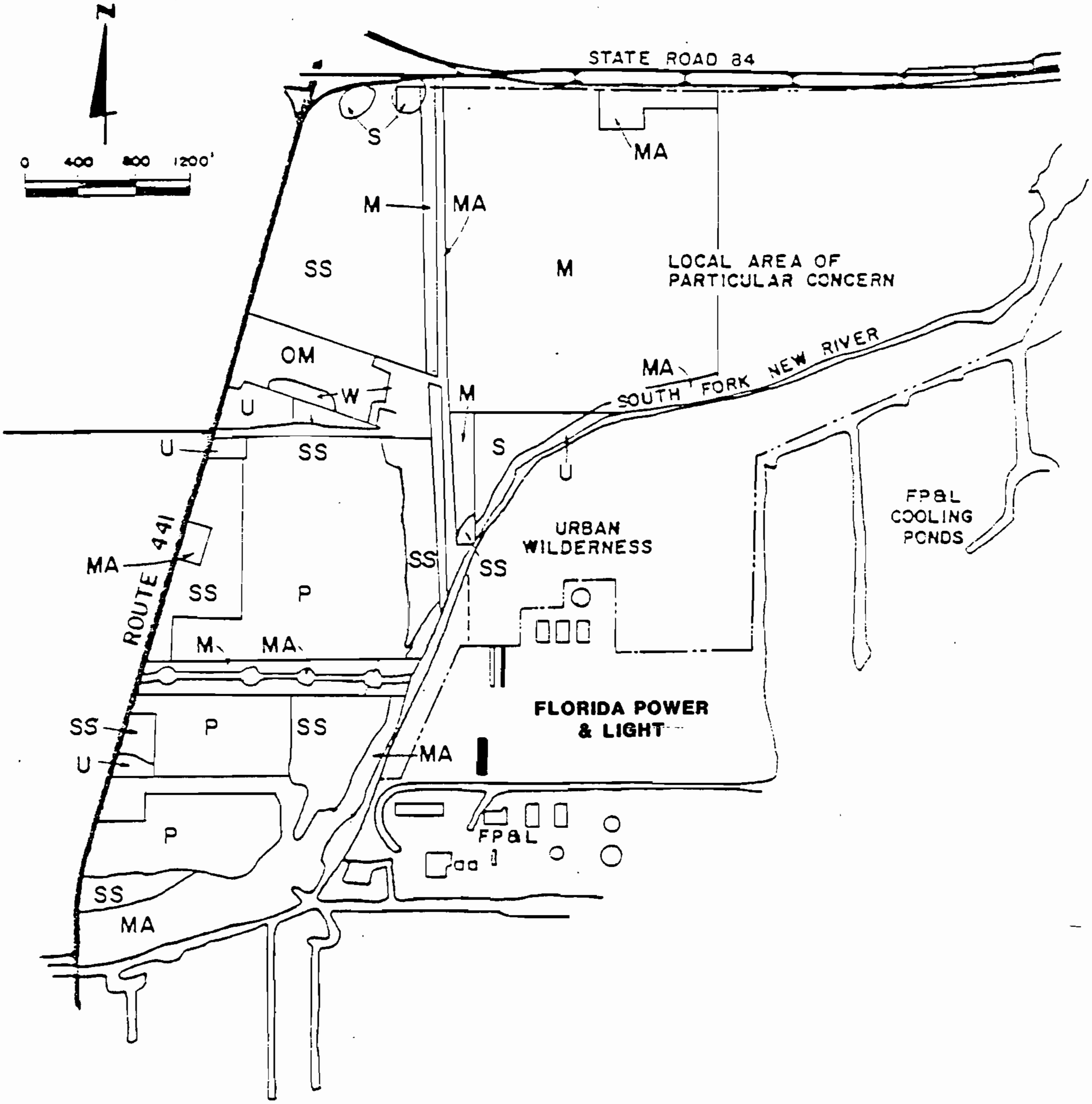
PFO2/3A – PALUSTRINE, NEEDLED LEAVED DECIDUOUS/BROAD-LEAVED EVERGREEN TEMPORARILY FLOODED, NONTIDAL

POWHX – PALUSTRINE, PERMANENTLY FLOODED OPEN WATER EXCAVATED

ᘁ – UPLAND



NATIONAL WETLANDS INVENTORY
LAND CLASSIFICATIONS



LEGEND

W - OPEN WATER
M - CATTAIL AND SAWGRASS MARSH
S - CYPRESS AND RED MAPLE SWAMP
SS - MIXED SHRUB SWAMP
P - WAX MYRTLE PASTURE
MA - MAINTAINED HABITATS
U - UPLAND HARDWOODS

VEGETATION MAP

TABLE 2.3.5.1

List of vascular plants identified during field reconnaissance, June, 1983, of the U.S. 441 Resource Recovery Facility site, Broward County, Florida. Nomenclature follows that of Godfrey and Wooten (1979, 1981), Long and Lakela (1971), or Lakela and Long (1976).

Scientific Name	Common Name
Acalypa setosa	(Three-seeded mercury)
Acer rubrum	Red maple
Acrostichum danaeifolum	Giant leather fern
Agalinis fasciculata	(Gerardia)
Albizia lebbek	Woman's tongue
Alternanthera philoxeroides	Alligator weed
Amaranthus spinosus	Spiny pigweed
Ambrosia artemesiifolia	Ragweed
Ampelopsis arborea	Pepper-vine
Andropogon glaucopsis	(Broomsedge)
Andropogon virginicus var. abbreviatus	(Broomsedge)
Anemia adiantifolia	Pine fern
Annona glabra	Pond-apple
Apios americana	Potato-bean
Asclepias incarnata	Swamp milkweed
Aster sp.	(Aster)
Axonopus furcatus	(Carpet grass)
Baccharis glomeruliflora	(Groundsel-tree)
Bacopa caroliniana	Blue-hyssop
Bidens pilosa	(Beggar ticks)
Blechnum serrulatum	(Blechnum fern)
Boehmeria cylindrica	Bog-hemp
Borreria terminalis	n.c.n.
Buchnera floridana	(Bluehearts)
Bulbostylis ciliatifolia var. ciliatifolia	n.c.n.
Capraria biflora	n.c.n.
Casuarina equisetifolia	Australian pine
Centella asiatica	False pennywort
Cephalantus occidentalis	Cotton buttonbush
Cestrum diurnum	Day jessamine
Chenopodium ambrosioides	Mexican tea
Chloris glauca	Fingergrass
Chrysobalanus icaco	Cocoa-plum
Cladium jamaicense	Saw-grass
Coccoloba uvifera	Sea-grapes
Commelina sp.	(Dayflower)
Conoclinium coelestinum	Mistflower
Conyza canadensis	Dwarf horseweed
Crinum americanum	Swamp-lily
Crotalaria retusa	(Rattlebox)
Cynanchum angustifolium	(Sand-vine)

MALCOLM PIRNIE

TABLE 2.3.5.1
(continued)

Scientific Name	Common Name
Cyperus compressus	(Galingale)
Cyperus elegans	(Galingale)
Cyperus globulosus	(Galingale)
Cyperus haspan	(Galingale)
Cyperus ligularis	(Galingale)
Cyperus polystachyos	(Galingale)
Cyperus rotundus	Nut-grass
Cyperus sesquiflorus	(Galingale)
Cyperus strigosus	(Galingale)
Cyperus surinamensis	(Galingale)
Desmodium canum	(Tick trefoil)
Dichromena colorata	White-top sedge
Digitaria serotina	(Crabgrass)
Echinochloa crusgalli	Barnyard grass
Eclipta alba	n.c.n.
Eleocharis atropurpurea	(Spikerush)
Eleocharis cellulosa	(Spikerush)
Eleocharis interstincta	(Spikerush)
Eragrostis sp.	(Love grass)
Erechtites hieracifolia	Fireweed
Eremochloa ophiuroides	Centipede grass
Erianthus giganteus	Giant plumegrass
Erigeron vernus	(Fleabane)
Eupatorium capillifolum	Dog-fennel
Eupatorium mikanioides	(Boneset)
Eustoma exaltatum	Catchfly-gentian
Ficus aurea	Strangler fig
Fimbristylis spathacea	n.c.n.
Fuirena squarrosa	(Umbrella-grass)
Galium tinctorium var. tinctorium	(Bedstraw)
Gaura angustifolia	Southern gaura
Heliotropium polyphyllum	(Heliotrope)
Heterotheca subaxillaris	(Golden aster)
Hydrocotyle umbellata	(Water pennywort)
Hydrolea corymbosa	(Waterleaf)
Hypericum brachyphyllum	(St.-John's-wort)
Hypericum myrtifolium	(St.-John's-wort)
Hypericum tetrapetalum	(St.-John's-wort)
Hyptis alata	(Bitter mint)
Ilex cassine	Dahoon holly
Ipomoea sagittata	(Morning-glory)
Juncus marginatus	(Rush)
Juncus megacephalus	(Rush)
Juncus polycephalus	(Rush)
Justicia ovata	n.c.n.
Kosteletzkya virginica	Seashore marsh-mallow
Lachnanthes caroliniana	Red-root

TABLE 2.3.5.1
(continued)

Scientific Name	Common Name
Lactuca intypbacea	Wild lettuce
Lantana camara	Shrub verbena
Lantana involucrata	(Lantana)
Lepidium virginicumi	Pepper grass
Ludwigia alata	n.c.n.
Ludwigia microcarpa	n.c.n.
Ludwigia peruviana	Primrose-willow
Lythrum lineare	(Loosestrife)
Manisurus rugosa	(Jointgrass)
Melaleuca quinquenervia	Cajeput
Melanthera angustifolia	n.c.n.
Metopium toxiferum	Poison-tree
Mikania scandens	Climbing hempweed
Mitreola petiolata	(Miterwort)
Myrica cerifera	Wax-myrtle
Myrsine guianensis	Myrsine
Osmunda regalis var. spectabilis	Royal fern
Oxalis corniculata	Lady's sorrel
Panicum hemitomon	Maidencane
Panicum repens	Torpedo grass
Panicum sp.	(Panic grass)
Parthenocissus quinquefolia	Virginia creeper
Paspalum dilatatum	Dallis grass
Paspalum distichum	Knot-grass
Pasplaum floridanum	Florida paspalum
Paspalum urvillei	Vasey grass
Passiflora suberosa	Corky-stemmed passionflower
Peltandra virginica	Green arum
Persea palustris	Swamp-bay
Phelbodium aureum	Golden polypody
Phragmites australis	Common reed
Phyla nodiflora	(Frog-fruits)
Phyllanthus caroliniensis	(Leaf-flowers)
Physalis viscosa ssp. maritima	(Ground cherry)
Phytolacca americana	Pokeweed
Plantago major	Common plantain
Pluchea rosea var. rosea	(Marsh-fleabane)
Poinciana regia	Royal poinciana
Poinsettia heterophylla	Painted leaf
Polygala grandiflora	(Milkwort)
Polygonum punctatum	(Smartweed)
Polypremum procumbens	n.c.n.
Pontederia cordata var. lancifolia	Lance-leaved pickerelweed
Prosperpinanca palustris	(Mermaid-weed)
Prosperpinaca pectinata	(Mermaid-weed)
Psidium guajava	Guava

TABLE 2.3.5.1
(continued)

Scientific Name	Common Name
Psilotum nudum	Whisk fern
Psychotria undata	(Wild coffee)
Rhynchelytrum roseum	Natal grass
Rhnychospora caduca	(Beak-rush)
Rhynchospora inundata	(Beak-rush)
Roystonea elata	Royal palm
Sabal palmetto	Cabbage palmetto
Sagittaria lancifolia	(Arrowhead)
Sagittaria latifolia var. latifolia	Common arrowhead
Salix caroliniana	Carolina willow
Sambucus canadensis	Elderberry
Sarcostemma clausum	Milk withe
Saururus cernuus	Lizard's-tail
Schinus terebinthiofolius	Brazilian pepper
Scleria verticillata	(Nut-rush)
Setaria geniculata	Knotroot bristlegrass
Sida acuta	n.c.n.
Sida rhombifolia	n.c.n.
Smilax laurifoliai	Bamboo-vine
Solanum americanumi	Common nightshade
Sonchus oleraceus	Common sow thistle
Sporobolus indicus	Smutgrass
Sporobolus poiretii	(Dropseed)
Stachytarpheta jamaicensis	Blue porterweed
Taxodium ascendens	Cypress
Teuchrium canadensei	Germander
Thelypteris kunthii	Kunth's shield fern
Thelypteris palustris	Marsh-fern
Tillandsia fasciculata	n.c.n.
Tillandsia polystachia	n.c.n.
Tillandsia recurvata	Ball moss
Tillandsia setacea	n.c.n.
Toxicodendron radicans	Poison ivy
Trema micrantha	Florida trema
Trifolium repens	White clover
Typha angustifolia	Narrowleaf cat-tail
Typha domingensis	Southern cat-tail
Typha latifolia	Common cat-tail
Urena lobata	Bur mallow
Verbestina virginica	Frost-weed
Vitis aestivalis	Summer grape
Vitis rotundifolia	Muscadine grape
Wedelia trilobata	n.c.n.
Xyris sp.	(Yellow-eyed grass)
Zizaniopsis miliacea	Water millet

of the wax myrtle pasture and shrub swamp area exhibits evidence (drainage ditches) of past farming efforts. Disturbance factors are numerous at this project site, and these detract both from the visible integrity of the biotic community and its functional attributes.

Open Water

Permanent open water exists in the New River Canal, in a small borrow pit near the northeast corner of, and in a rectangular pond south of a nursery located on State Road 7. No rooted submerged aquatic plants were found in any of these bodies of water. The shorelines have emergent plants in a narrow fringe, but depth of water appears to be the chief limiting factor for aquatic plants.

Cattail-Sawgrass Marsh

An extensively disturbed marsh area extends from U.S. 84 south, is bounded on the east by the proposed Anne Kolb Park cypress tract, on the west by the low berm beneath a Florida Power and Light transmission line, and on the south by a berm associated with a gas pipeline. Although historic photography was not available for inspection, the location of this community and cypress stumps present indicate that it was previously covered by cypress swamp or mixed red maple-cypress-and wax myrtle. The present vegetation is characterized by scattered cabbage palmetto trees, wax-myrtle bushes, and very tall herbaceous plants including three species of cattails, sawgrass, water millet, and galingales. Shallow water areas contain colonies of swamp-lily, arrowhead, and lance-leaved pickerelweed. Many other marsh and swamp species are scattered throughout the community.

Cypress-Red Maple Swamp

This biotic community is dominated by an open canopy of mostly short deciduous trees, and with a shrub layer that is comprised of mostly evergreen woody plants, interspersed with dense colonies of sawgrass. Occasionally, in the wetter portions, giant leather ferns are abundant. The trees that occur in this community, with the exception of infrequent Australian pines, often have a profusion of air plants, and these species contribute to the tropical or "jungle" appearance of the swamp. That portion of the project area included in this community type is far less impressive than the cypress swamp of adjacent Anne Kolb Park (proposed).

Mixed Shrub Swamp

A large tract of cutover, disturbed thicket lies east of State Road 7 in the northeast quadrant of the project area. The community contains remnant trees of red maple and cypress that would suggest that the site was formerly cypress and red maple swamp. Locally high areas are usually populated by Australian pine, or sometimes cajeput saplings. An overgrown canal extends in a north-south direction along the west margin of an FP&L utility line. Several bulldozed openings exist and usually connect with State Road 7. The area is marked with shallow depressions and dotted with small rises where stumps and slash have been pushed aside. Other areas identified as mixed shrub swamp are predominantly Florida holly, wax myrtle, buttonbush and willows. Many species occur here, both herbaceous and marshland, as well as shrubs.

Wax Myrtle Pasture

Much of the Project site is comprised of poorly improved pasture lands amid a sparse to moderately thick coppice of wax myrtle bushes. Surface disturbance by cattle insures that many seeds are pushed into the black mucky substrate; therefore, the groundcover is very diverse and many species of marshes and wet savannas are present. Occasionally on higher ground exotic species can become established, and it is not surprising to find occasional Florida holly or Australian pine seedlings or saplings in this zone. The development of the wax myrtle dominated community probably arises from abandonment of fields and frequent utilization by cattle delays the successional trend toward a forest community.

Maintained Habitats

Several types of maintained habitats exhibiting a range of conditions from dry to wet, and with mostly herbaceous to predominantly wood plants occur in the study area. Roadside shoulders are typically sandy, and covered by grasses and other herbs. The large power line corridors tend to be slightly wetter. They also contain a few woody species and several more herbaceous species than that encountered along the rights-of-way of State Road 7 and State Road 84. The gas line corridor is wet, and in places, is covered by standing water or marsh vegetation. Several disturbed areas have grown up into groves of tall Australian pines, and very few herbaceous plants are found beneath this type of forest canopy. Because of the diversity of microhabitats, this biotic community contains the greatest assortment of native and naturalized vegetation within the study area.

Upland Hardwoods

Situated mostly along the high berm of dredged material on the banks of the New River Canal, upland hardwoods show characteristics not only of drier south Florida hammocks but also of highly disturbed spoil banks found near limestone mines and by drainage canals. The rocky spoil supports ferns, various shrubs, and low but large-crowned trees. Strangler figs are present as young seedlings and as canopy plants. The edge of the uplands nearest the New River Canal may contain exotic species that have arrived by floating to the site; the side of the berm away from the canal sometimes contains swamp species that edge upward.

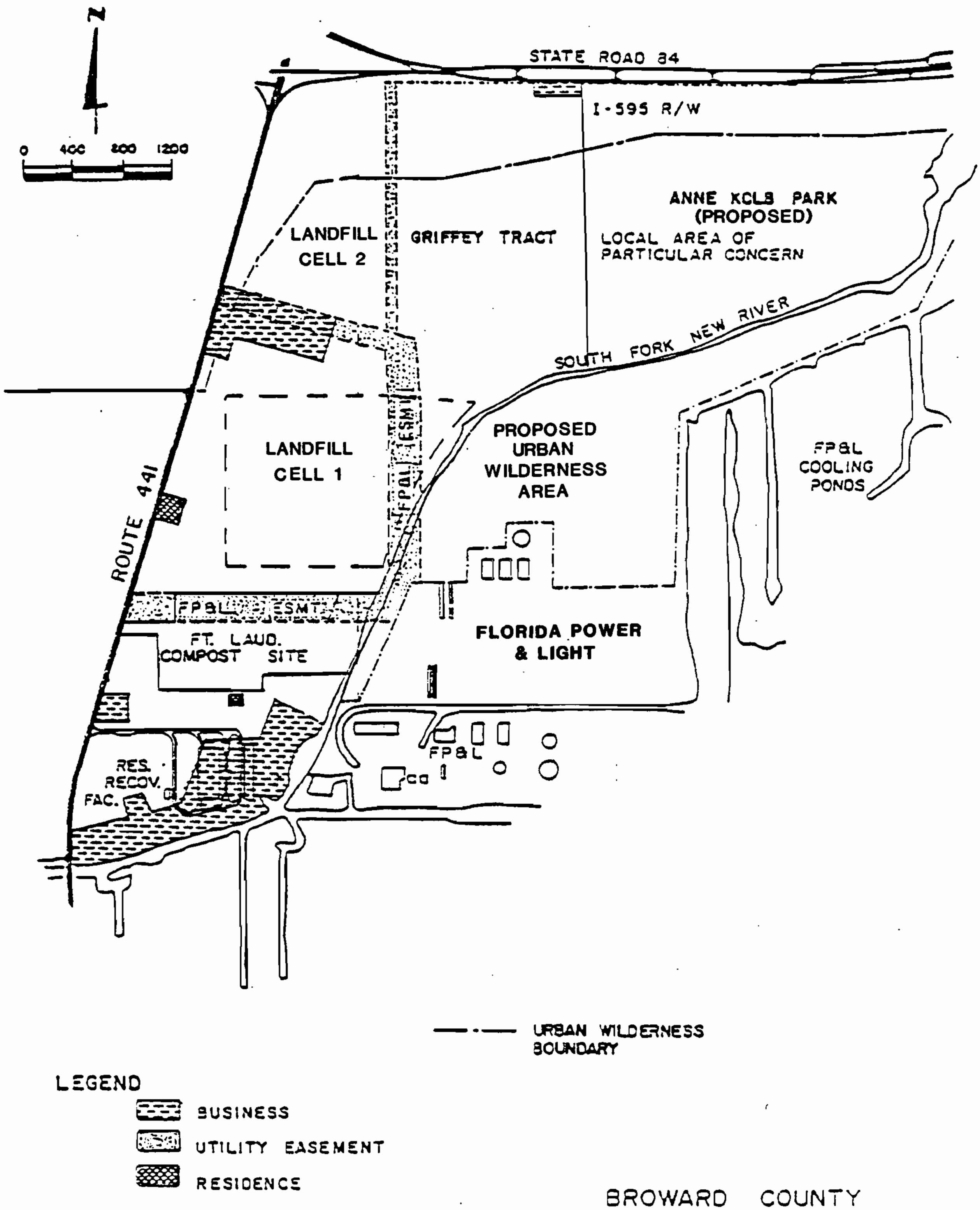
2.3.5.2 Urban Wilderness

The second biological concern is that portion of the project area which has been proposed as an Urban Wilderness Area, i.e. a 300 foot-wide strip of waterfront and the marsh in the northwestern corner of the site (Figure 2.3.5.3). The area is proposed for urban wilderness status because it is considered the last vestige of natural vegetation along the South Fork of the New River Canal. The 300 foot-wide strip of urban wilderness adjacent to the river will be preserved and enhanced (Section 3.2.3 and Appendix 10.1.4). Much of the area identified as the Griffey Tract (Figure 2.3.5.3), will be utilized as the location for landfill cell 2 which is critical to the project. This area is currently a sawgrass marsh of which up to an 800 foot swath fronting State Road 84 will be required for I-595 right-of-way. Cypress stumps throughout the marsh indicate that it was previously part of the swamp forest adjacent to the west, and that the area regenerated to sawgrass after it was cut over.

2.3.5.3 Sensitive Plant Species

Nineteen plant species, considered rare, threatened or endangered (Ward, 1979; State of Florida, 1978, USDI, 1979), are known from Broward County (see Table 2.3.5.2). Of these, nine occur in wetlands similar to those found originally on site. These are:

Acrostichum danaeaefolium	Leather fern
Aspleinium serratum	Bird's Nest Spleenwort
Commelina gigas	Gian Dayflower
Drosera intermedia	Water Sundew
Nemastylis floridana	Fall-flowering Ixia
Polygala smallii	Tiny Polygala
Tillandsia fasciculata	Wild Pine Bromeliact
Tillandsia flexuosa	Twisted Air-plant
Zamia floridana	Florida Coontie
Roystonea elata	Florida Royal Palm
Sabal palmetto	Cabbage Palm
Cocus nucifera	Coconut Palm



BROWARD COUNTY
RESOURCE RECOVERY
EXISTING LAND USE
AND DEVELOPMENT TRENDS

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 danaeaefolium	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.

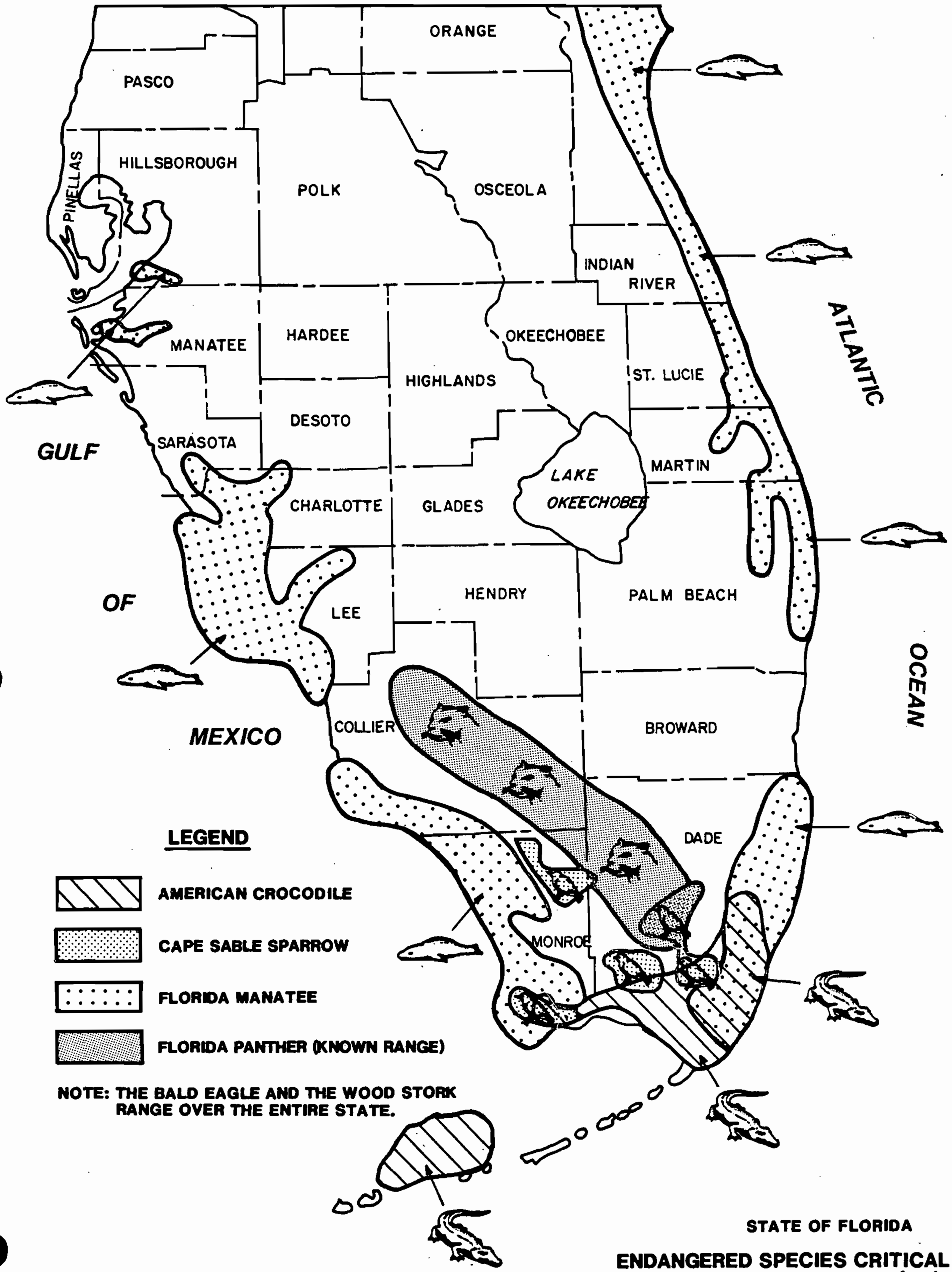
3. Section 581.185, Florida Statutes.

Of the twelve, five species were found--the cabbage palm, the Giant Dayflower, the leather fern, the Wild Pine Bromelaid and the Florida Royal Palm. The absence of the other species is not surprising in view of the heavy pastural uses made on the property.

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 vertebrate which are endangered, threatened or rare species or species of special concern found in the southern half of the State. Field studies during site analysis have not identified any threatened or endangered species on the project site and the probability of their presence is low. The site has been reviewed by the U.S. Fish and Wildlife Service (Jacksonville, FL) and development is not expected to impact any endangered or threatened species (Personal Communication, 12 July 1983, Don Palmer, Endangered Species Specialist, U.S. Fish and Wildlife Service). Both the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service stated by letter (Appendix 10.1.4) that the project would not jeopardize the West Indian (Florida) Manatee and the American Crocodile. Rare and endangered species of vegetation have been discussed in Section 2.3.5.

A list of vertebrates found on or near the site is presented in Table 2.3.6.2. It is not anticipated that the proposed facility will have any effect on these species. Vegetation on or near the site and the area proposed for urban wilderness designation was discussed in Section 2.3.5. The proposed urban wilderness area is the lone remaining example of a forested non-tidal wetlands system in the eastern regions of Broward County. The mitigation for the project will preserve and enhance this area (Appendix 10.1.4).



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 SPECIA 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

TABLE 2.3.6.2

VERTEBRATES FOUND ON-SITE OR NEAR THE SITE
OF THE PROPOSED BROWARD COUNTY RESOURCE RECOVERY FACILITY
AND LANDFILL

Mammals	Birds
Gray squirrel	Cattle egret
Raccoon	Mourning dove
Marsh rabbit	Rock dove
Oppossum	Great white heron
Manatee	Great blue heron
Mole	Yellow warbler
Field mice	Palm warbler
Cotton rat	Red-winged blackbird
	American kestrel
	Pileated woodpecker
	Barn owl
	Screech owl

Reptiles	Amphibians
Several species of snakes	Toads
Lizards	Frogs
Striped mud turtle	

Source: Field Observations/CZR Inc.

2.3.6.1 Species-Environmental Relationships

It is not anticipated that the proposed Resource Recovery Facility and Landfill will have any significant effects on area ecology. Terrestrial on-site fauna can move to the east of the site into the proposed urban wilderness area which is being preserved and enhanced (Appendix 10.1.4 and 10.7). Aquatic fauna in the New River Canal adjacent to the site will be affected only when the runoff from the on-site retention ponds exceeds storage capacity. Lastly, migratory species can relocate in nearby areas.

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 do not indicate the occurrence of stress as a result of nearby industrial operations. The site has been previously altered. It has been used as pasture land, a marine construction yard, nursery, power transmission line easement, oil and gas pipeline easements, etc., which has resulted in changes in the habitats found originally and the pattern of ecological succession which would have occurred naturally.

An examination of water quality of the South Fork New River Canal (C-11 Canal) bordering the site indicates that the waters are nutrient rich. Sources are run-off (fertilizers) and treated effluent discharges.

2.3.6.3 Measurement Programs

In March 1983, a surface water sampling program was initiated at the site. The procedure and data is presented in Section 2.3.4.1. Collection and analysis of all the parameters measured were performed in accordance with Methods for Chemical Analysis of Water and Wastes (U.S. Environmental Protection Agency, 1979). In May 1984, a second sampling program was initiated in order to determine bacteriological quality of the surface waters. The procedure and data is also presented in Section 2.3.4.1. Analyses were performed in accordance with the latest edition of Standard Methods. Also, data on surface water quality was obtained from the Broward County Environmental Quality Control Board (Appendix 10.9).

In addition, a special tree survey was conducted on site. For the purpose of the survey, trees were defined as woody vegetation with a diameter breast height of a minimum of 3 inches and an overall height of 7 feet. This tree survey is exhibited in Plate 5 of Appendix 10.1.4.

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 35 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 (BCEQCB) and Florida Power and Light Company (FP&L).

Temperature

Temperature means and extreme for Miami are presented in Table 2.3.7.1. The climate is tropical with a large marine influence from the Atlantic Ocean and Biscayne Bay. The mean temperature varies of 75.6°F. Record extreme temperatures ranged from a low of 3±°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 attrib-

MALCOLM PIRNIE

TABLE 2.3.7.1

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	33
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: NOAA, 1983.

uted 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 2.3.7.2 for the hours of 0100 and 0700 in the morning and 1300 and 1900 in the afternoon for specified periods. 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.

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 2.3.7.2.

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

TABLE 2.3.7.2

PRECIPITATION AND DIURNAL RELATIVE HUMIDITY MEASURED
AT MIAMI, FLORIDA

Month	Precipitation (inches)			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.

maximum winds will exceed 124 mph, that of a great hurricane. Tropical cyclones usually approach Miami from early August to late October.

Statistics compiled 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 2.3.7.3. 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 m.

Atmospheric Stability

Monthly and annual frequencies of Pasquill's stability classes are shown in Table 2.3.7.4. 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 Table 2.3.7.5. As can be seen, there is a large easterly component of wind under neutral and stable air masses.

TABLE 2.3.7.4

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	10.1	42.6	45.5
Annual	0.1	5.4	13.7	42.0	38.6

Source: NOAA, 1974.

TABLE 2.3.7.5

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

TABLE 2.3.7.5 (continued)

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	0.001335	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 2.3.7.5 (continued)

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	0.000210	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 2.3.7.5 (continued)

JOINT FREQUENCY DISTRIBUTION OF WIND AND PASQUILL STABILITY CLASS
MIAMI, FLORIDA, 1969 THROUGH 1974

SPEFC(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 DISTRIBUTFD ABOVE WITH C STABILITY = 0.000856

TABLE 2.3.7.5 (continued)

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	0.007391	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 2.3.7.5 (continued)

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	0.009334	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.

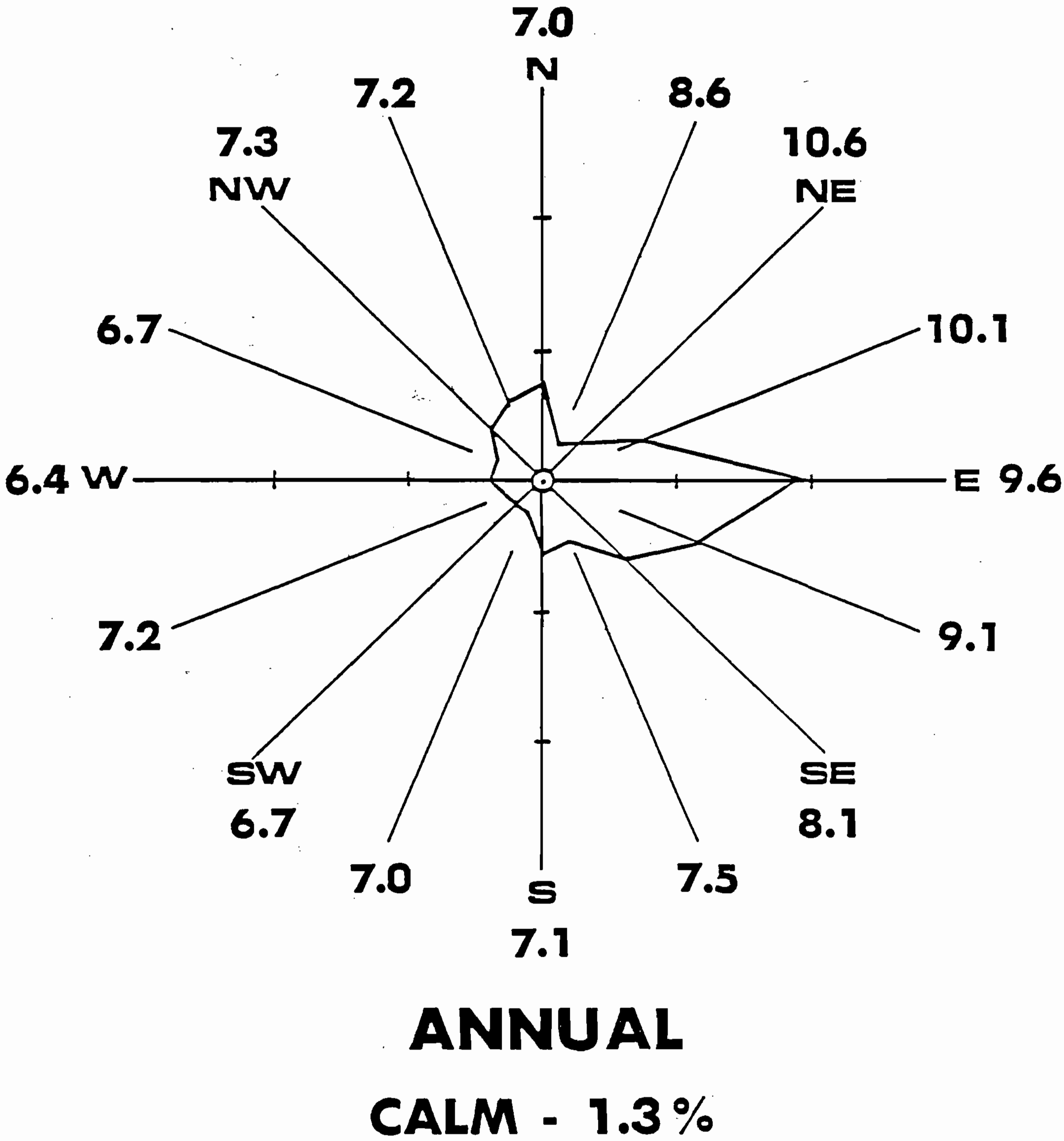
Wind Patterns

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 2.3.7.1 presents monthly and annual wind roses for the six 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 2.3.7.6. There are currently 18 sites operated by Broward County and 3 sites operated by FP&L. Based on the PSD monitoring guidelines (USEPA, 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.

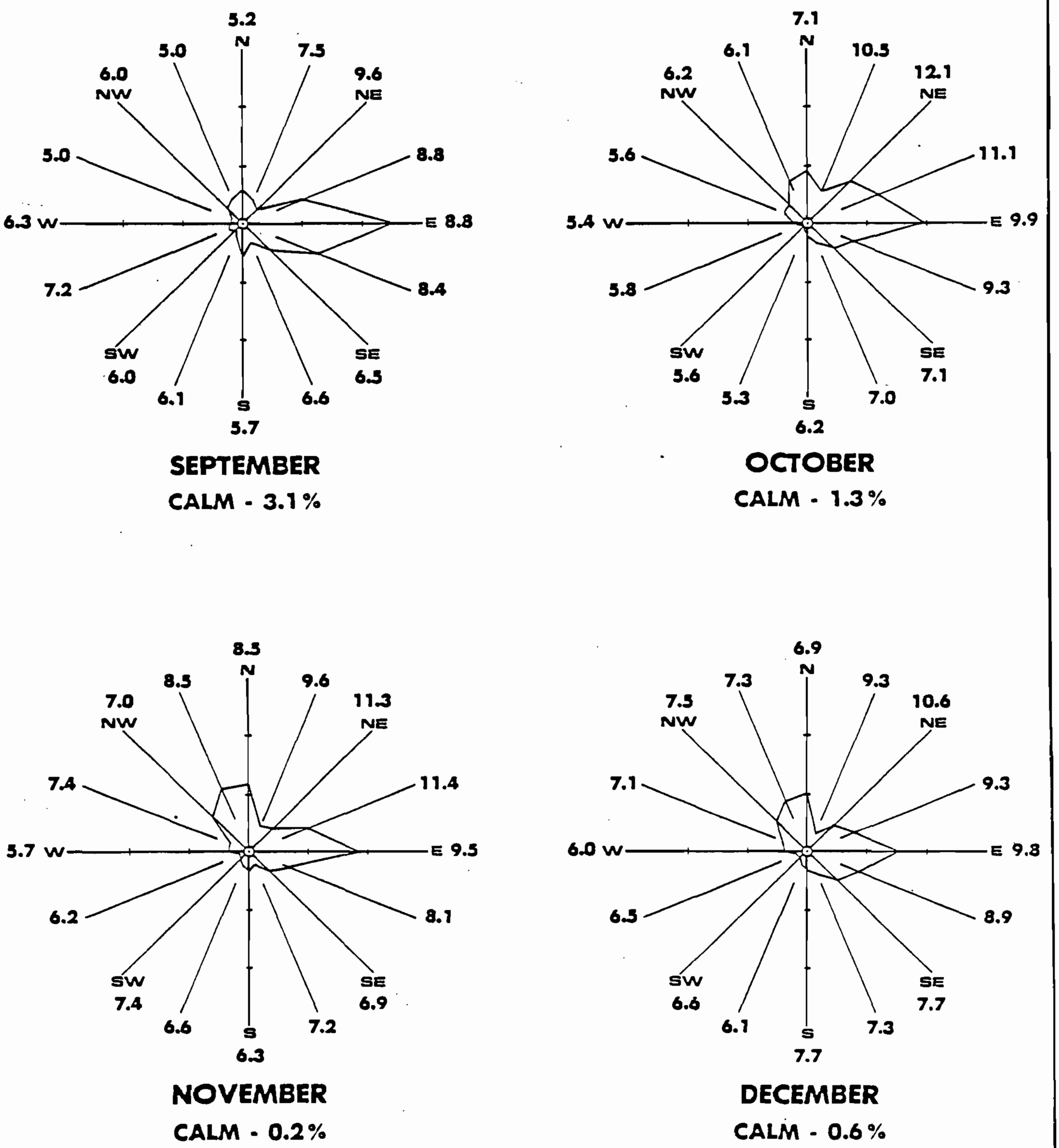
The existing monitoring sites located within 10 km of the facility are listed in Table 2.3.7.7. The maximum concentrations measured during 1983 are also presented in this table. Based on these measured maximum concentrations, pollutant concentrations within a 10-km radius from the facility are less than the national and Florida Ambient Air Quality Standards (AAQS), except for Carbon Monoxide (CO). In Table 2.3.7.7, although Broward County monitoring site No. 4 is 11.4 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 2.3.7.7, the measured SO^2 and NO_2 concentrations are well below AAQS.



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

SOURCE: NOAA, 1974.

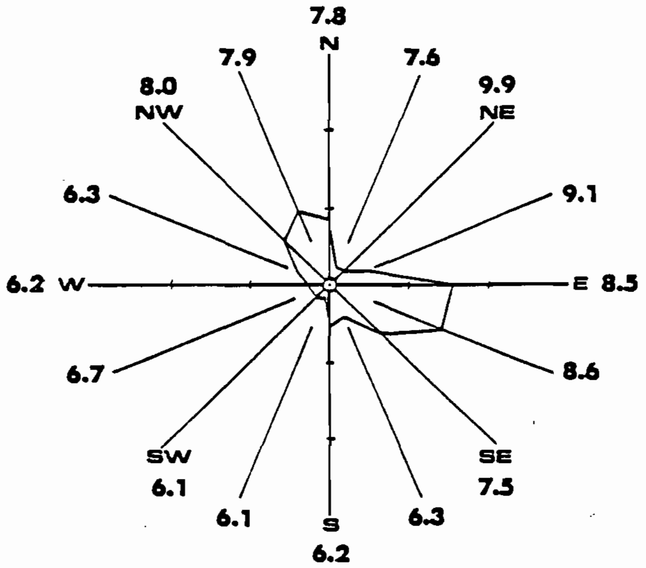
AVERAGE MONTHLY AND ANNUAL WIND ROSES FOR MIAMI, FLORIDA 1969-1974



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

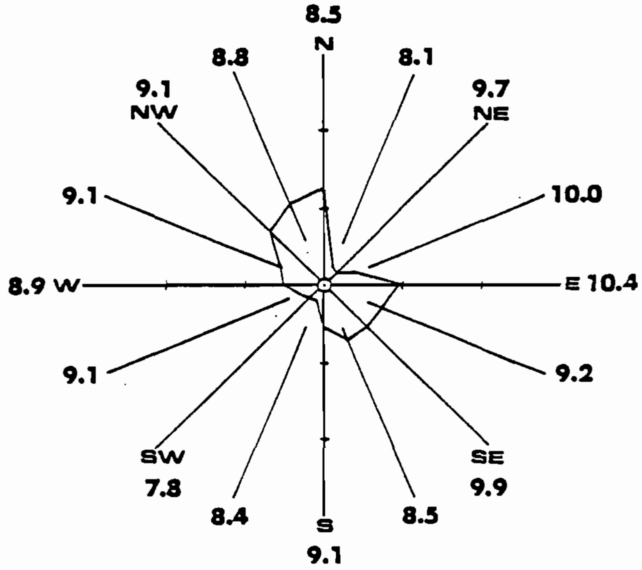
SOURCE: NOAA, 1974.

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



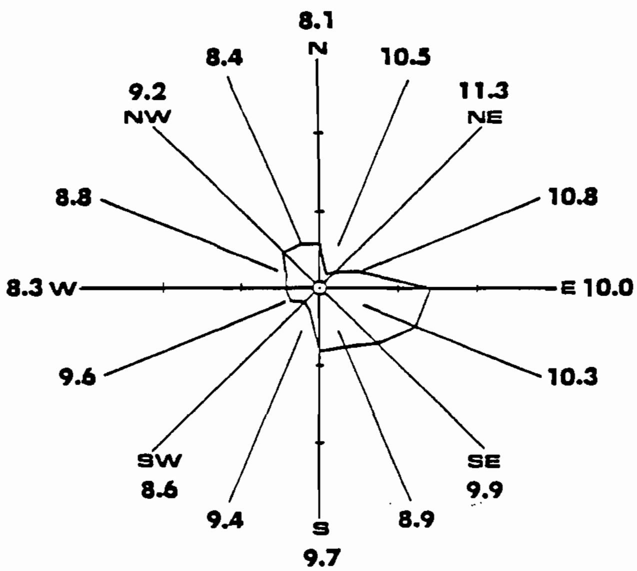
JANUARY

CALM - 1.4%



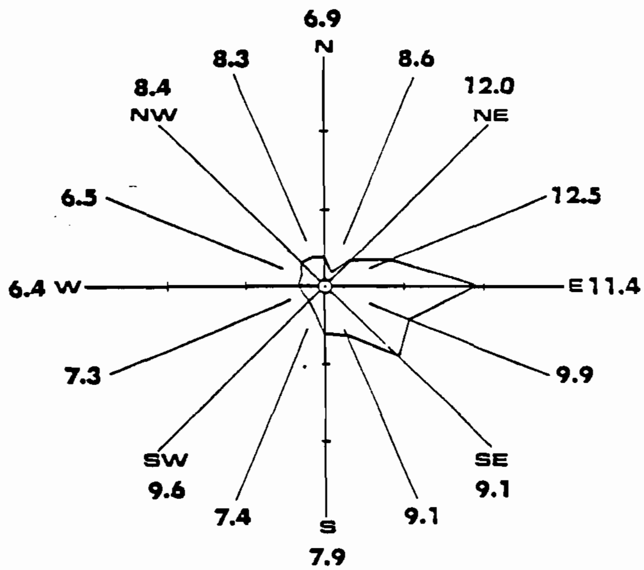
FEBRUARY

CALM - 0.4%



MARCH

CALM - 0.5%



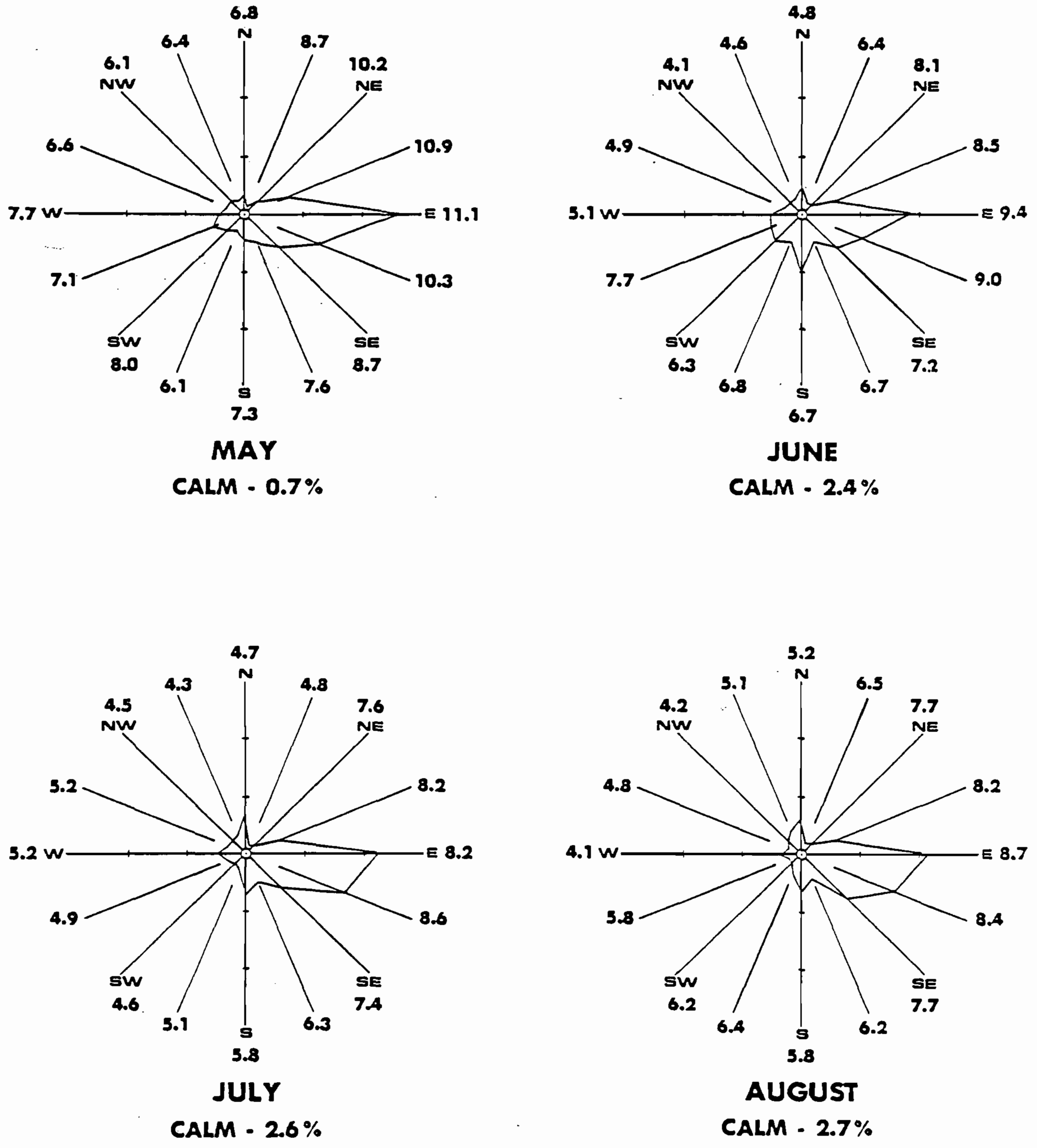
APRIL

CALM - 0.1%

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

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 3 OF 4)

SOURCE: NOAA, 1974.

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

TABLE 2.3.7.6

AMBIENT AIR MONITORING SITES IN BROWARD COUNTY DURING 1983

SAROAD No.	Broward County No. or Operator	Location: City/Division	Location: UTM, X,Y Coordinates (km)	Pollutant Measured	Location with Respect to North Facility: Direction (°)	North Facility: Distance (km)	South Facility: Direction (°)	South Facility: Distance (km)
3700003G01	1	Pompano Beach	590.17, 2908.00	TSP, Pb	62	7.0	23	26.8
3700002G01	3	Pompano Beach	587.85, 2902.79	TSP	117	4.3	23	21.1
2270001G01/09	4	Lauderdale Lakes	579.55, 2804.87	TSP, NO_2, SO_2, CO	204	10.9	360	11.4
3640002G01	5	Plantation	575.52, 2891.27	TSP	212	15.9	334	9.4
1260003G01	6	Ft. Lauderdale	583.11, 2890.09	TSP, NO_2, SO_2, CO, Pb	183	14.7	27	7.6
4350001G01	7	Tamarac	574.44, 2897.87	TSP	234	11.8	340	15.4
0910002G01	8	Davie	576.19, 2884.99	TSP, NO_2 SO_2	202	21.1	296	3.81
3530001G01	9	Pembroke Pines	575.26, 2877.44	NO_2, SO_2	198	28.7	216	7.3
1840001G01	10	Hollywood	582.21, 2876.98	TSP, Pb	184	27.8	158	6.9
1640001G01	11	Hallandale	584.60, 2874.44	TSP	179	30.3	151	10.2
1260004G01/09	12	Ft. Lauderdale	585.20, 2887.20	TSP, NO_2, SO_2	176	17.6	55	6.8
0420002G01	13	Hacienda Village	579.70, 2885.34	CO	192	19.9	3	2.0
0420003G03	14	Coral Springs	571.60, 2906.88	O_3	280	12.6	341	24.9
3530002G01/09	15	Pembroke Pines	570.00, 2878.40	TSP	208	29.8	297	10.8

MALCOLM PIRNIE

TABLE 2.3.7.6 (continued)

AMBIENT AIR MONITORING SITES IN BROWARD COUNTY DURING 1983

SAROAD No.	Broward County No. or Operator	Location: City/Division	Location: UTM, X,Y Coordinates (km)	Pollutant Measured	Location with Respect to North Facility: Direction (°)	North Facility: Distance (km)	South Facility: Direction (°)	South Facility: Distance (km)
0420004G01	16	N. Lauderdale	577.73, 2900.11	O_3	234	7.8	354	16.9
3700004G01	17	Pompano Beach	585.34, 2900.13	CO	164	4.8	19	17.8
1840002G01	18	Hollywood	584.00, 2875.87	CO	180	28.9	150	8.6
2560002G01	19	Margate	578.86, 2903.51	TSP, Pb	257	5.3	358	20.2
1260005J02	FP&L	Ft. Lauderdale	579.28, 2882.35	TSP, NO_2, SO_2	192	22.9	199	1.0
1260005J02	FP&L	Ft. Lauderdale	583.05, 2883.85	TSP, NO_2, SO_2	183	20.9	81	3.5
1260007J02	FP&L	Ft. Lauderdale	589.10, 2886.85	TSP, NO_2, SO_2	164	18.6	70	10.1

Source: ESE, 1985.

TABLE 2.3.7.7

1983 AMBIENT AIR QUALITY DATA FOR MONITORING STATIONS WITHIN
10 KM OF THE PROPOSED FACILITY

Broward County No. or Operator	SAROAD No.	Concentration (ug/m^3)*							
		TSP		SO_2		NO_2	CO†		Pb
		24-hr	Annual	24-hr	Annual	Annual	1-hr	8-hr	Quarter
5	3640002G01	84	31	-	-	-	-	-	-
6	1260003G01	115	59	11	3	48	18	9	0.7
8	0910002G01	76	33	21	9	31	-	-	-
9	3530001G01	-	-	6	3	34	-	-	-
10	1840001G01	95	45	-	-	-	-	-	0.3**
12	1260004G01	93	39	29	5	35	-	-	-
13	0420002G01	-	-	-	-	-	21**	10**	-
18	1840002G01	-	-	-	-	-	9	7	-
FP&L	1260005J02	95**	42**	19**	5**	38**	-	-	-
FP&L	1260007J02	88	36	19	5	25	-	-	-
Florida AAWS		150	60	260	60	100	30	10	1.5

*For short-term averages, second-highest concentration is shown.

†00 concentrations in mg/m^3.

**Closest monitoring station for specified pollutant.

Source: ESE, 1985.

The only measured pollutant that approached AAQS in 1983 was CO. Within a 10-km radius of the proposed facility, the highest and second-highest 8-hour average CO concentrations equalled the 8-hour AAQS at one monitor location (i.e., Broward County Site No. 13). Based on data received through September 1983 from DER and Broward County Environmental Quality Control Board (EQCB), the highest and second-highest 8-hour average concentrations measured at Broward County Site No. 13 in 1984 were 10 and 9 mg/m^3, respectively. Thus, the second-highest concentration at this site is slightly less than the AAQS of 10 mg/m^3.

2.3.7.3 Measurement Programs

All information (i.e., meteorology and air quality data) was compiled from off-site monitoring 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 with wind sensors located 23 feet above grade. Regular service 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 EPA- and DER-approved Industrial Source Complex Short-Term (ISCST) model were used to predict the maximum air quality impacts due to the proposed plant. The ISCST model is an extended version of the single-source CRSTER model. The

ISCST model is designed to calculate hourly concentrations based on hourly meteorological parameters. The hourly concentrations are processed into non-overlapping short-term (e.g., 3- and 24-hour) average periods and then summed and averaged to produce annual average concentrations. Because the impacts from the proposed plant were low and generally less than the PSD significant impact levels, only emissions from the proposed plant were considered in the air quality modeling analysis.

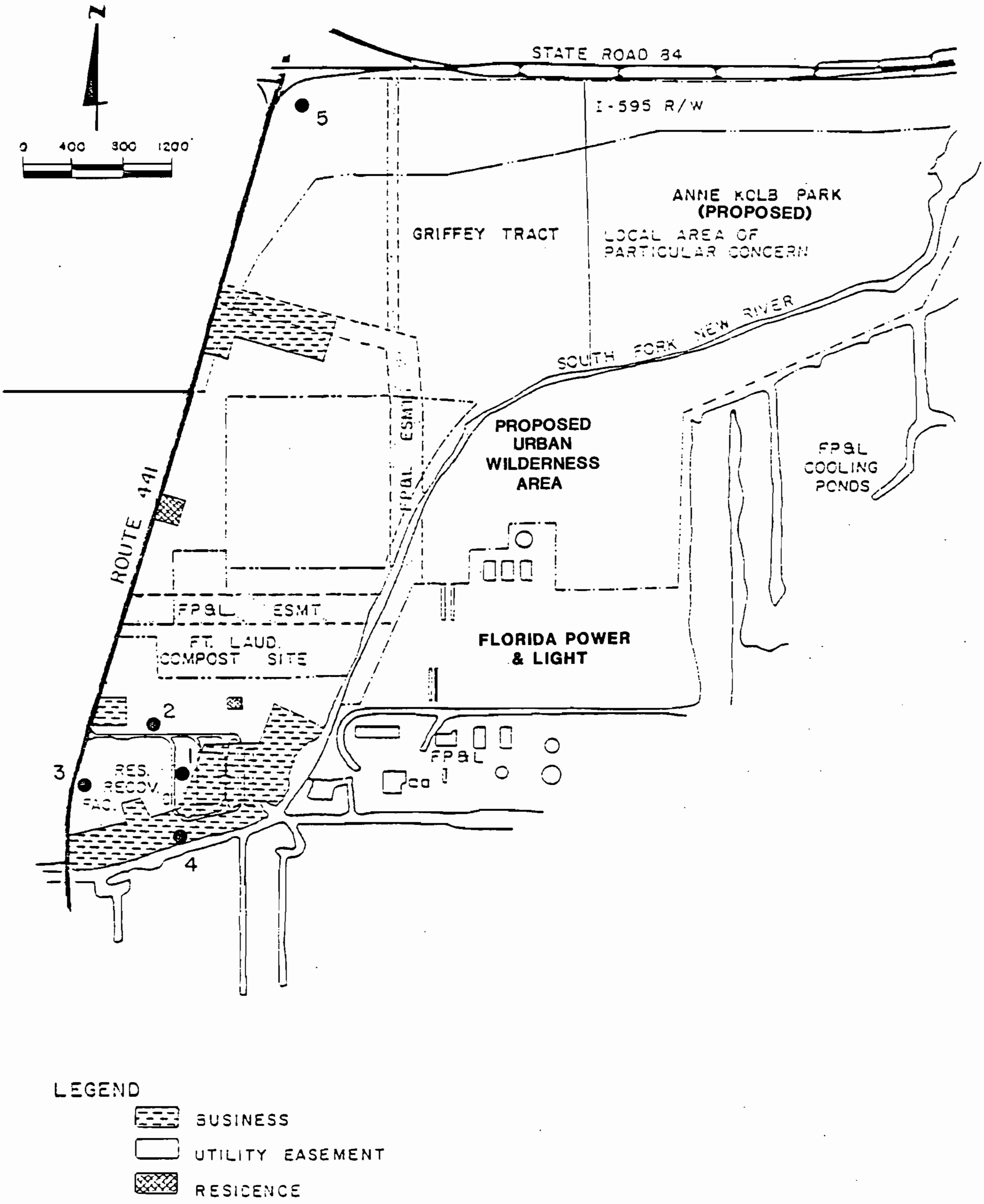
2.3.8 <u>Noise</u>

A technical noise analysis was performed for this application and is contained in Appendix 10.10. Existing ambient source levels were measured at five different locations around the perimeter of the site in order to establish baseline conditions during day and night-time periods. These locations are shown on Figure 2.3.8.1. Site 1 is on the east side along the road to Powell Brothers Construction Company. Site 2 is on the north side on Powell Road midway between Route 441 and the east side line. Site 3 is on the west side along Route 441. Site 4 is on the south side along the woods adjacent to the canal and is closest to a residential area. Site 5 is located at the intersection of Route 441 and State Road 84.

The average noise levels at each of the five sites are presented in Table 2.3.8.1. These levels are in decibels (dB(A)). The higher the decibel level the lower the sound. A change of ten times the energy level of the sound is presented as a 10 dB(A) change in the sound scale.

The average noise levels of 50-55 dB(A) are below or at the standards set forth in the Broward County Code of Regulations for residential zoning. Residential zoning is the most stringent sound level limit at 55 dB(A). Therefore, the ambient noise levels do not exceed the County sound level limits.

FIGURE 2.3.8.1



BROWARD COUNTY

RESOURCE RECOVERY PROJECT

AMBIENT NOISE READING LOCATIONS

2.3.9 Other Environmental Features

Information pertaining to the resource recovery and associated facilities, located in Broward County at the Route 441 site, has been completely addressed in the scope of the preceding topics. Therefore, all of the environmental features of the proposed facility have been addressed.

TABLE 2.3.8.1

AVERAGE AMBIENT NOISE READINGS
February 23, 1984

Site	Time	Average (dB(A))
1	2:30 PM	55
	9:00 PM	52
2	2:30 PM	55
	9:00 PM	51
3	2:30 PM	55*
	9:00 PM	52.5
4	2:30 PM	51
	9:00 PM	53
5	2:30 PM	55*
	9:00 PM	53

*85 dB(A) with heavy constant vehicular and truck traffic.

Note: In all locations, low flying commercial aircraft gave readings from 70 dB(A) to 85 dB(A).

MALCOLM PIRNIE

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 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 comes 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.)

- 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

- o Available in proprietary and non-proprietary system designs
- o High volume reduction (10 percent) of input solid waste to be landfilled as ash residue
- o Marketable energy products
- o 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:

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

- o Mass burning systems firing as-received solid waste, rank the highest in demonstrated reliability.
- o Mass burning systems can generate either steam or electricity which is highly marketable.
- o Capital and operating and maintenance costs associated with mass burning systems are competitive with alternative solid waste processing systems.
- o 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 Site. 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:

- o Site adequacy
- o Required transport costs
- o Acquisition and development costs
- o Access and adequacy
- o Potential air and water quality impacts
- o Wetland impacts
- o Adjacent land use

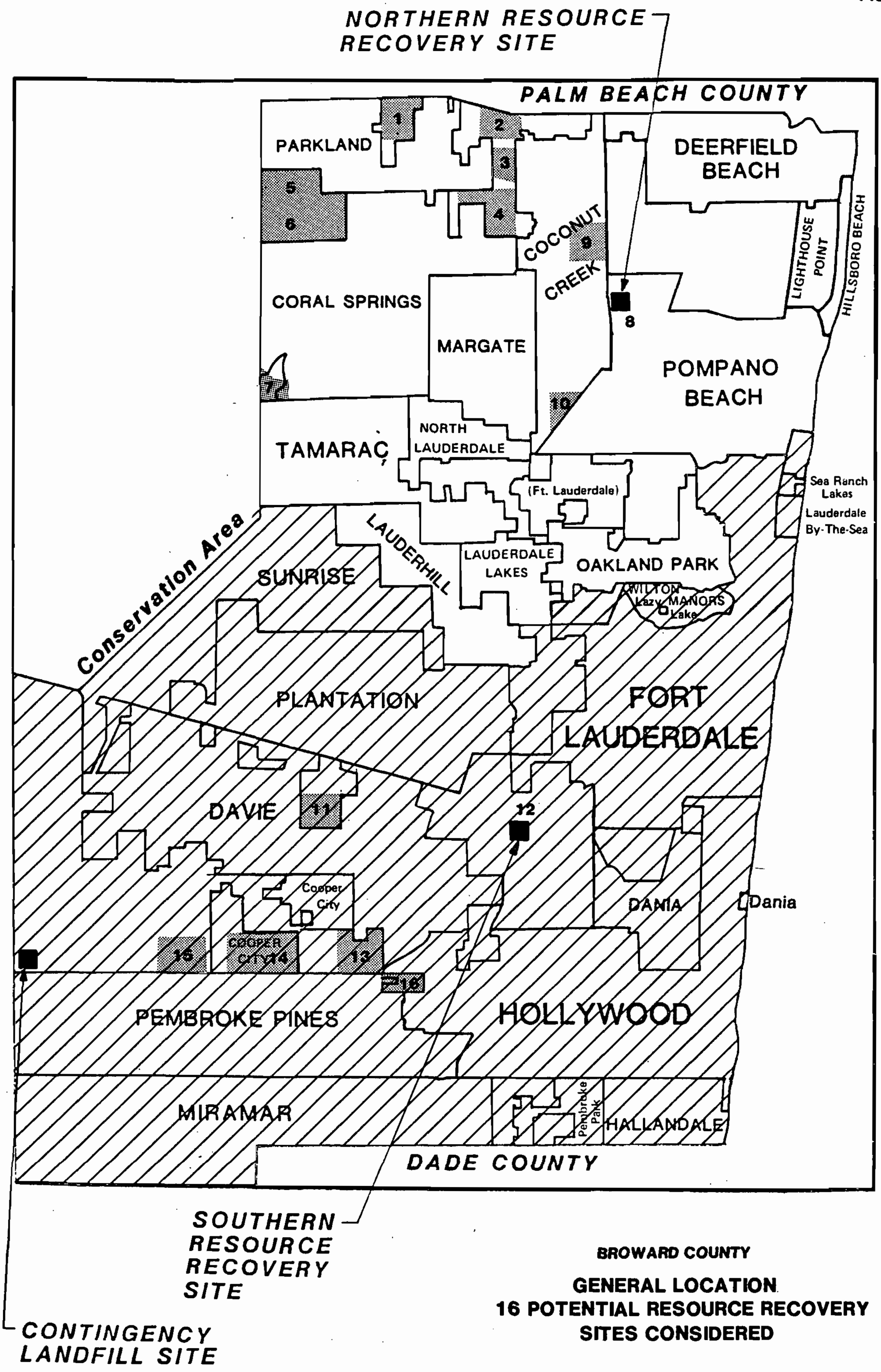
- o Zoning and land use plans
- o Traffic impacts
- o Conformance with regulations
- o Permitting approval probability

The results of this evaluation were summarized in a March, 1982 report which recommended the proposed Route 441 site for development of a resource recovery facility to serve the southern region of the County.

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.

The County in late 1982 added the requirement of a residue/unprocessable waste landfill adjacent to the resource recovery facility and decided to re-evaluate the top three ranked southern sites. In early 1983, an analysis of the technical, environmental and regulatory aspects associated with each of the sites was undertaken. The purpose of the analysis was to rank the sites according to their acceptability for the development of the southern full service disposal project. The three sites evaluated were:

- o <u>Broward Correctional Institute (BCI)</u> - This site represents the area surrounding the State of Florida Woman's Correctional Institute located between



BROWARD COUNTY

GENERAL LOCATION
16 POTENTIAL RESOURCE RECOVERY SITES CONSIDERED

Stirling Road and Sheridan Street near U.S. 27 in West Broward.

- o <u>Davie</u> - This site is located adjacent to the existing Broward County Sanitary landfill at the northwest intersection of Orange Drive and Shotgun Road.
- o <u>Route 441</u> - This site is located at the southeast intersection of U.S. Route 441 and State Road 84.

The results of this evaluation indicated that the Route 441 site was the most appropriate site for development of the Southern Resource Recovery Facility. Subsequent developments concerning the second ranked Davie site indicated that as a result of legal complications, the site was unacceptable for development as a resource recovery facility. These legal complications involve the uncertainty of the jurisdictional location of the Davie site. The Town of Davie, in opposition to the potential siting of the resource recovery project, alleged that the site had been annexed within the Town of Davie boundaries. Development at this site would therefore require the rezoning approval of the Town of Davie. The County concluded that the time required to complete the legal process would delay the project beyond the exhaustion of the County's current waste disposal capabilities. A legal opinion provided by the County Office of General Counsel concerning this situation is attached as Appendix 10.2.

The third site, an area adjacent to the Broward Correctional Institute, has been selected as a sanitary landfill for interim disposal during the period when the existing County landfill at Davie has exhausted its capacity and the southern resource recovery facility has not yet become operational, and for contingency disposal during periods when the southern resource recovery facility may not be operating at full capacity. Landfill design drawings and specifications are currently being prepared for site development that will satisfy the County's interim disposal and contingency disposal needs for the 20 year project planning period.

In addition, contingency disposal capability is anticipated to be available landfill capacity, current waste projections, and the current schedule for implementation of both the northern and southern resource recovery facilities.

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 due 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 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, thereby enabling southern facility development unaffected by the status of the northern site. Proposals were received on November 16, 1984 on the proposed southern facility from American Ref-Fuel and Signal RESCO. These proposals are currently being evaluated by County staff and consultants. It is anticipated that a Vendor will be selected for this project during June, 1985.

3.2 Site Layout

The facility is slated to have an initial maximum installed capacity of 2,352 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. A schematic diagram describing the mass burn process of a typical resource recovery facility is presented in Figure 3.2.1. 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 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 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 the furnace to produce steam. The steam will then be transmitted to turbine generators to produce electricity for internal use and sale to Florida Power and Light Company.

Each boiler 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.

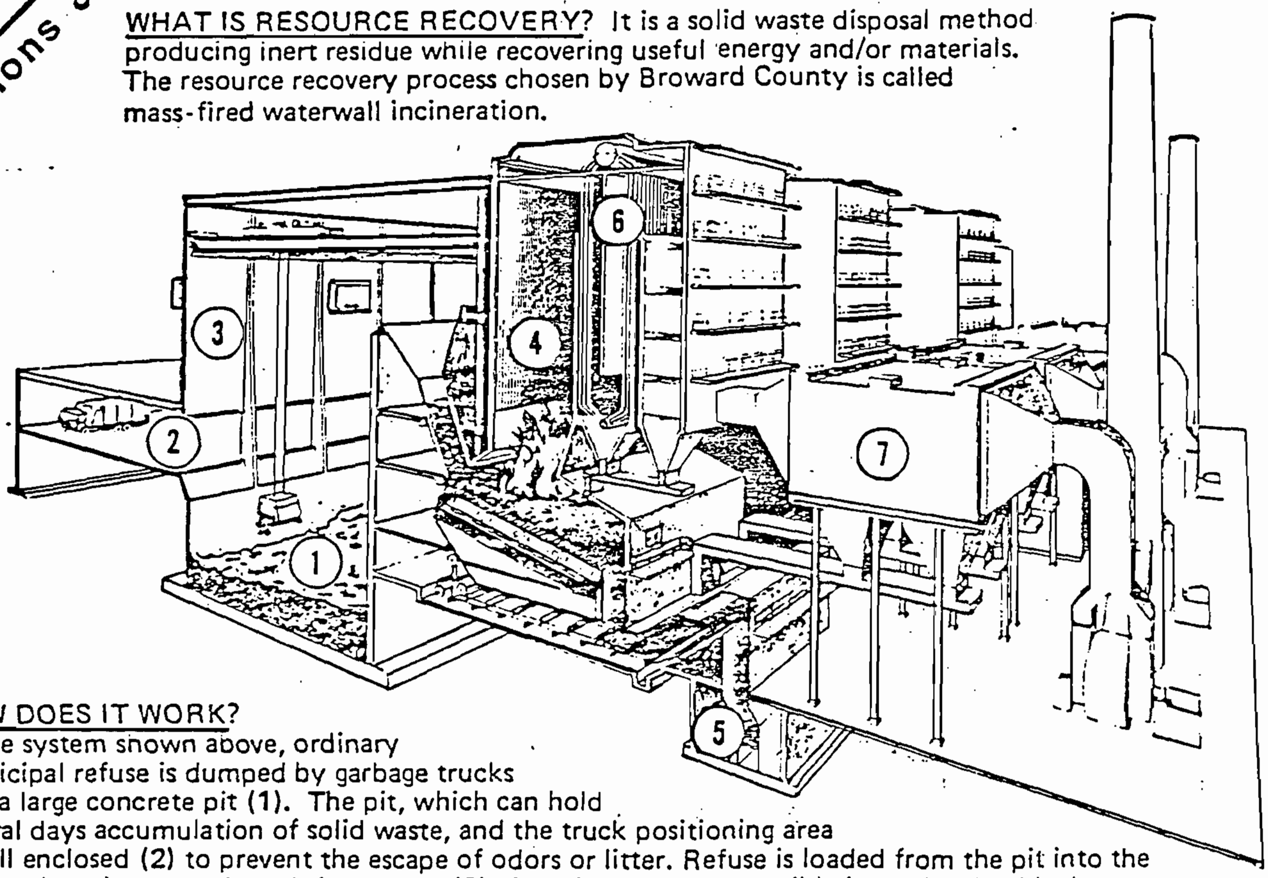
Bottom ash from the furnace and flyash from the precipitator will be mixed prior to removal from the facility. The combined ash will comprise 10 percent of the volume and 25 percent of the weight of the solid waste processed by the facility. The ash will be quenched with water to about 30 percent moisture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

As noted above, while the proposed facility will have ultimate design capacity of approximately 3,300 tpd and four boiler units, its maximum initial installed capacity will be 2,352 tpd and three 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.

Questions & Answers

Broward County
RESOURCE RECOVERY PROGRAM

WHAT IS RESOURCE RECOVERY? It is a solid waste disposal method producing inert residue while recovering useful energy and/or materials. The resource recovery process chosen by Broward County is called mass-fired waterwall incineration.



HOW DOES IT WORK?
In the system shown above, ordinary municipal refuse is dumped by garbage trucks into a large concrete pit (1). The pit, which can hold several days accumulation of solid waste, and the truck positioning area are all enclosed (2) to prevent the escape of odors or litter. Refuse is loaded from the pit into the furnace by a large overhead bridge crane (3). Oversized or unprocessible items (engine blocks, tree stumps, concrete rubble, etc.) which accidentally get into the pit can be removed at this point and either sent directly to the landfill, or put through a shredder for size reduction prior to being sent to landfill or sold.

In the furnace (4) the refuse is burned at high temperature and under controlled conditions of air and turbulence. The result is essentially complete destruction of organic material, (paper, plastic, wood, food wastes, etc.) leaving an ash residue (5) which contains the unburnable fraction (glass, metal, ceramics, etc.). This residue has a volume of five to ten percent of the original solid waste, thus lengthening the projected landfill lifetime by a factor of ten to twenty.

Hot gases from the combustion process pass up through the boiler portion (6) of the furnace where the heat is transferred to water-filled steel tubes. This heat is used to generate steam and ultimately electricity.

After passing through the boiler the hot gases pass through electrostatic precipitators (7) which act as giant filters removing the dust particles from the gas stream. The clean gases are then discharged at the stack.

HAS THIS METHOD OF RESOURCE RECOVERY BEEN SUCCESSFUL ELSEWHERE?
Yes. There are over 400 plants of this type in successful operation worldwide, some for as long as 30 years. There are about a dozen in the U. S., including Pinellas County, Florida; Saugus, Mass.; Hampton, Va.; Chicago, Ill.; Harrisburg, Pa.; and others. Several more are under construction.

3.2.1 Resource Recovery Facility

As illustrated on Figure 2.1.2 and described in Section 2, Site and Vicinity Characterization, the resource recovery facility will be developed such that:

- Left turn, acceleration, and deceleration lanes will exit at the signalized intersection of U.S. Route 441 and ingress road to the facility. The main on-site roadway will provide two-way traffic (east and west).

- A visitor parking area and administrative building will be located south of the main facility building.

- Vehicles entering the site will be weighed at the scalehouse/weigh station located between the main facility building and site entrance.

- A receiving area including an enclosed turning platform, tipping floor, overhead crane, and refuse pit will be located on the west side of the main facility building.

- The furnace/boilers and auxiliary equipment will be located east of the receiving area.

- The turbine generator will be located adjacent to the furnace/boilers.

- The electrostatic precipitators (air pollution control equipment) will be located east of the boilers, adjacent to the ash handling area and directly in front of the plant's stack.

- The electrical substation necessary to tie into the Florida Power and Light grid system will be located just north 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 are conceptual illustrations depicting the facility from various angles and elevations. The figures were taken from respective vendor proposals and in no way reflect a preference for any one vendor design. Full details of the technical specifications required for facility design are contained in Appendix 10.11.

Figure 3.2.1.1 - General Arrangement Section (Longitudinal Section)

A cross sectional view of the facility is provided in Figure 3.2.1.1. Refuse packer trucks will enter the reception area from the west side of the facility and dispose of their compacted loads into the refuse storage pit. The clearance from the roof truss to the tipping floor will be approximately 26 feet. The refuse storage pit will have a depth of approximately 45 feet from the tipping floor. Refuse deposited into the pit will be removed by either of two traveling, overhead, 12-ton capacity bridge cranes. Each crane will be equipped with a 7 cubic yard grapple.

The duel crane system enables one crane to feed refuse into the charging hopper while the other crane mixes the waste and removes oversized bulky wastes from the pit.

The charging hopper will accommodate approximately 100 cubic yards of solid waste. There is a hydraulically operated arch-breaker at the throat of the feedhopper to dislodge objects that might interrupt the flow. The approximate elevation of the charging hopper is 90 feet above the refuse pit floor. Refuse placed in the charging hopper is funnelled to a mass burning grate system; a hydraulic ram feeder controls the flow of refuse into the furnace. The furnace boiler and grate system is west of the receiving area and forms the heart of the facility. It is here that potential energy contained in the unprocessed raw refuse is effectively converted to steam for use in the generation of electric power.

The movement of the grate system provides for controlled combustion of the refuse. The ash and inerts are discharged at the end of the grate system and deposited for removal by the ash handling system. Heat generation caused by combustion is transferred to the boiler by water-cooled tubes thereby producing steam. The products of combustion are cleaned in

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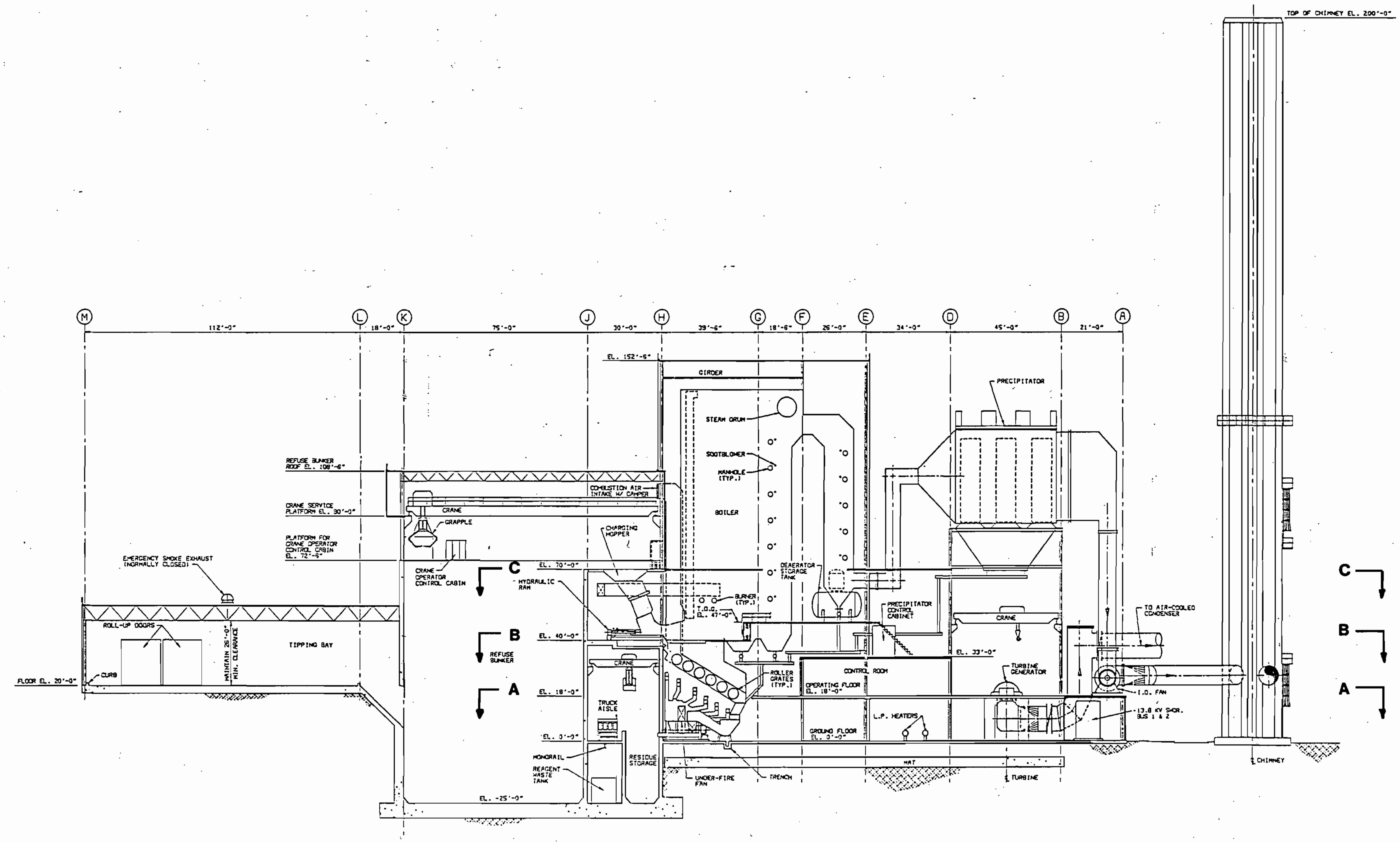
FIGURE 3.2.1.1



CONCEPTUAL DESIGN

REVISIONS	REFERENCE DRAWINGS	PRINT RECORD	ENG. RECORD	DRAWING STATUS

GENERAL ARRANGEMENT SECTION

BROWARD COUNTY RESOURCE RECOVERY (SOUTH) FACILITY

11-00-001

005

AMERICAN REF-FUEL

electrostatic precipitators located east of the boiler furnaces prior to discharge into the atmosphere through the stack.

The longitudinal section presents three elevation composites for further consideration; Sections "A-A", "B-B", "C-C". Composite "A-A" is a cut of the facility at an elevation that is approximately 18 feet. Composite "B-B" is a cut of the facility at an elevation of approximately 30 feet. Composite "C-C" is an elevation of approximately 70 feet. These composites are presented as Figures 3.2.1.2 through 3.2.1.4 in the following sections.

Figure 3.2.1.2 - Operational Floor Plan "A-A"

A view of the operating floor at approximately elevation 18 feet is provided in Figure 3.2.1.2. This view is identified as Section "A-A" on Figure 3.2.1.1. The turning platform/tipping floor is located on the west side of the facility. The approximate size of the receiving area is 255 feet long and 112 feet wide with a floor to rafter height of approximately 26 feet. The pit will be designed to provide a minimum four days storage capacity or 32,000 cubic yards without exceeding the elevation of the tipping floor. Overall pit dimensions are approximately 75 feet by 255 feet.

At this elevation (approx. 18 ft) we can see, moving east, boiler feed pumps, the logic equipment room, control room, and the turbine generator. Still further east the induced draft system fan and stack are visible.

Figure 3.2.1.3 - Operational Floor Plan "B-B"

A view of the operating floor plan at an elevation of approximately 40 feet is provided on Figure 3.2.1.3 (Section "B-B" on Figure 3.2.1.1). At this elevation, moving east to west, is the receiving area, refuse pit, and ram feeders that move the waste through the furnace. In addition, the waste feed hoppers, boilers, and the electrostatic precipitators (ESP's) are visible.

Figure 3.2.1.4 - Operational Floor Plan "C-C"

A view of the operating floor plan (General Arrangement) at an elevation of approximately 70 feet is provided in Figure 3.2.1.4 (Section "C-C" on Figure 3.2.1.1). In addition to systems previously identified in Figures 3.2.1.2 and 3.2.1.3, the refuse crane and associated rail, crane control cabin, and charging hoppers are visible. Additionally, there is a clear view of the electrostatic precipitators located east of the boilers. As illustrated, the design calls for one stack with multiple flues.

Figure 3.2.1.5 - Turbine Building

The turbine building, will be located on the east side of the facility and is shown in Figure 3.2.1.5.

Figure 3.2.1.6 - Ash Handling System

The interior processes of the ash handling system are presented in Figure 3.2.1.6. Ash is removed from the quench tank by means of a vibrating conveyor system. The conveyor transfers the ash to the ash storage area. Movement of ash through the building is in a westerly direction. Ash is removed from storage by a 40 cubic yard ash truck and transported to the adjacent southern resource recovery residue/unprocessable waste landfill for final disposal.

Figures 3.2.1.7 and 3.2.1.8 - East and North Elevation

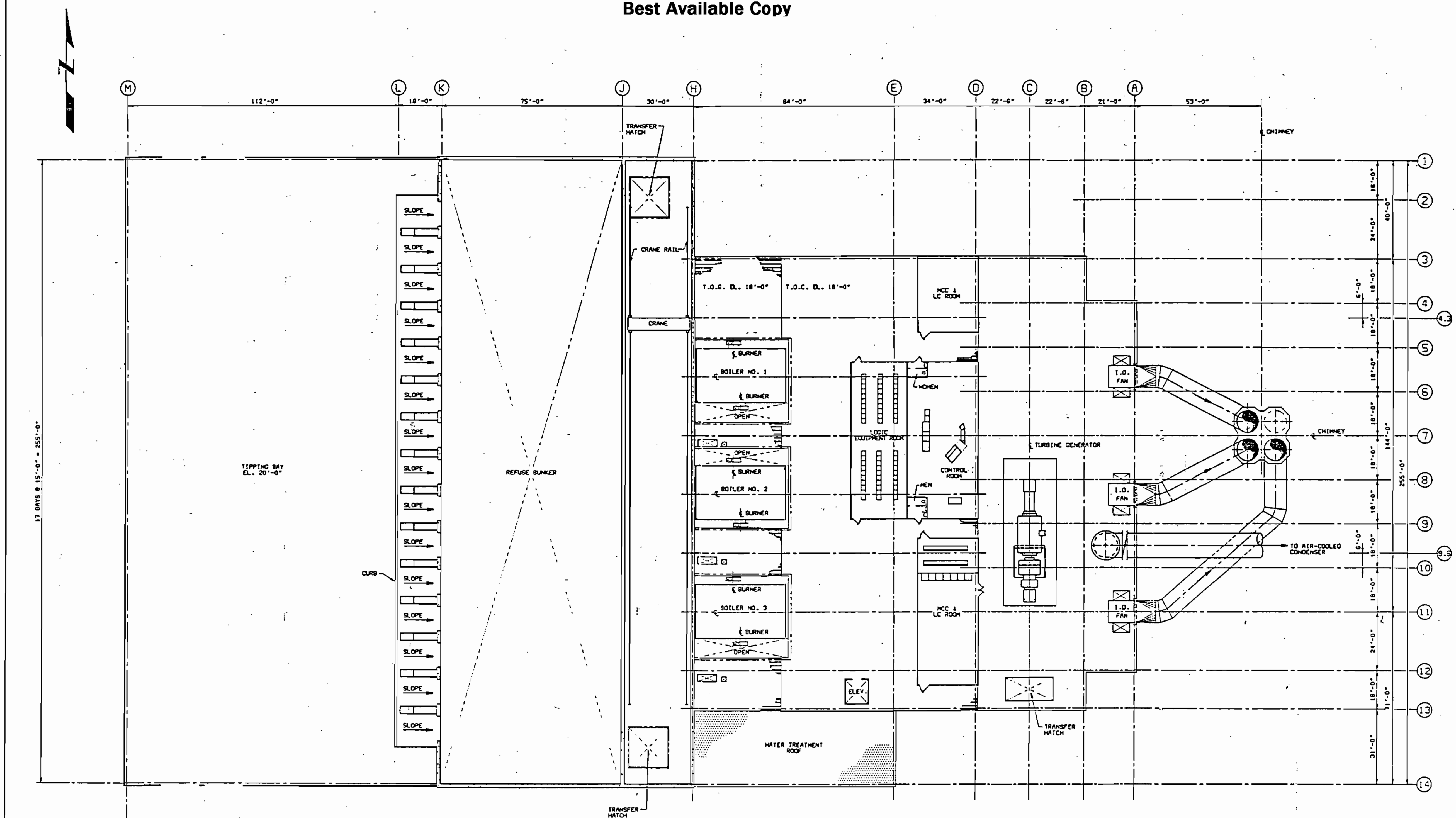
Typical east and north elevation views of the facility are provided in Figures 3.2.1.7 and 3.2.1.8, respectively. As these views illustrate, the facility will be designed to provide a pleasing aesthetic appearance.

3.2.2 Ash Residue/Unprocessable Waste Landfill

As illustrated on Figure 2.1.3 and described in Section 2, Site and Vicinity Characterization, the ash/residue unprocessable waste will be such that:

- Two cell areas will be developed to handle the unprocessable and ash residue waste streams.

FIGURE 3.2.1.2
(SECTION A-A)



GENERAL NOTE
1. ARROWS ON STAIRS INDICATE DIRECTION DOWN.

CONCEPTUAL DESIGN

REVISIONS	REFERENCE DRAWINGS	PRINT RECORD	ENG. RECORD	DRAWING STATUS

GENERAL ARRANGEMENT
PLAN @ EL. 18'-0"

BROWARD COUNTY RESOURCE RECOVERY SOUTH FACILITY

REF-FUEL

11-00-001

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FIGURE 3.2.1.3
(SECTION B-B)

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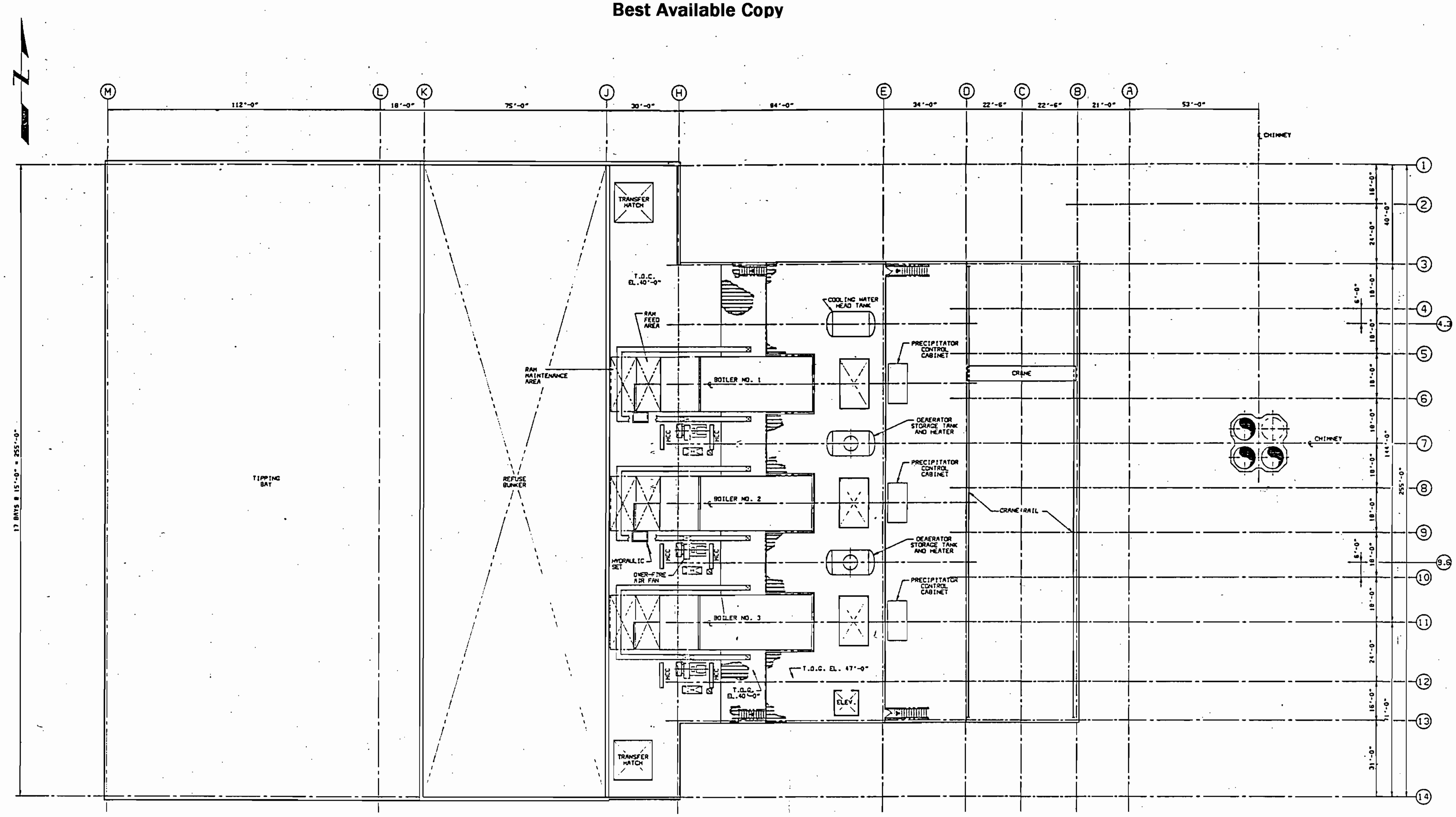

GENERAL NOTES:
1. ARROWS ON STAIRS INDICATE DIRECTION DOWN.

CONCEPTUAL DESIGN

REVISIONS | REFERENCE DRAWINGS | PRINT RECORD | ENG. RECORD | DRAWING STATUS

GENERAL ARRANGEMENT
PLAN @ EL. 40'-0"

BROWARD COUNTY RESOURCE RECOVERY (SOUTH) FACILITY

1/16" = 1'-0"

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FIGURE 3.2.1.4
(SECTION C-C)

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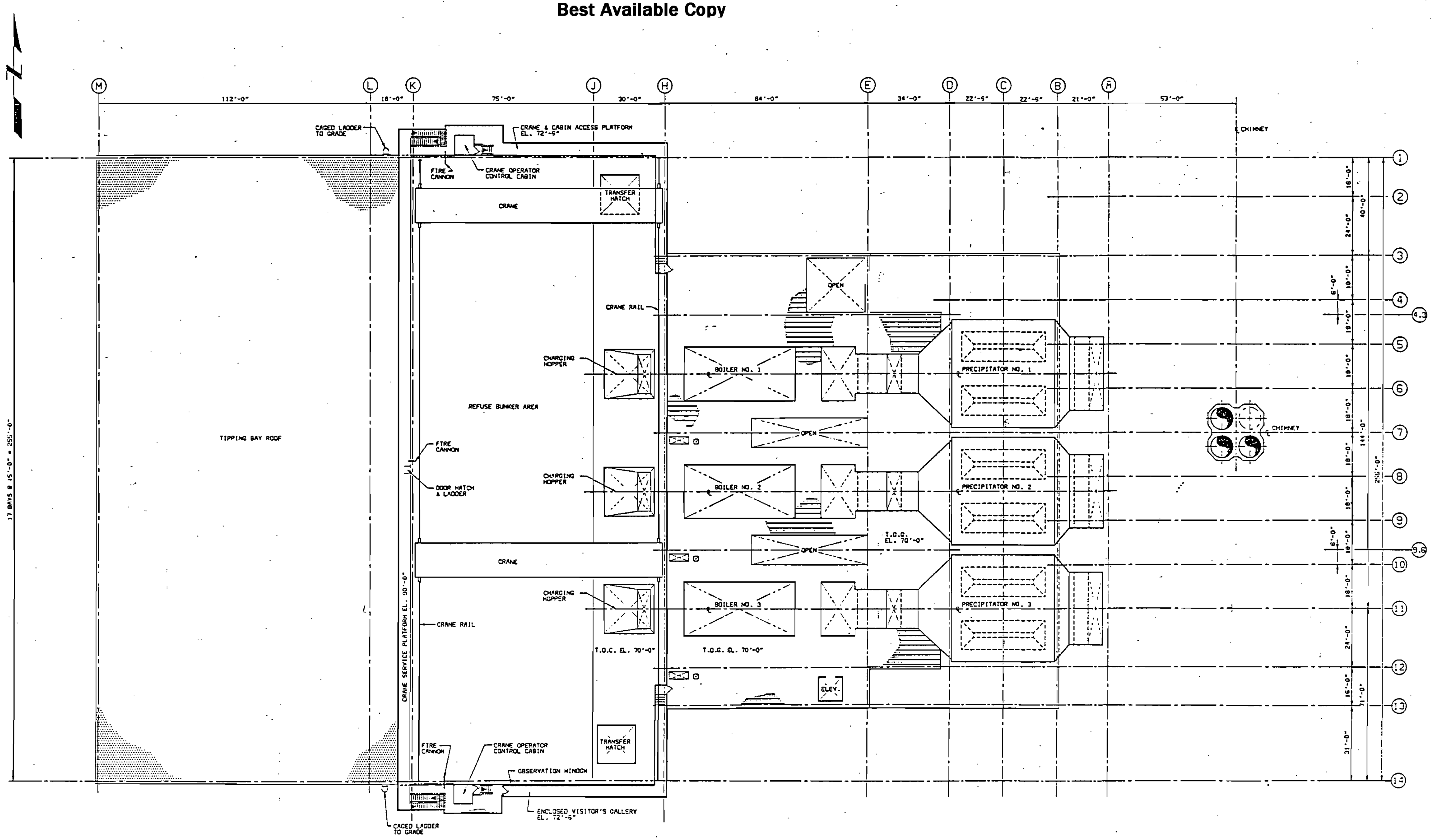

GENERAL NOTE
1. ARROWS ON STAIRS INDICATE DIRECTION DOWN

CONCEPTUAL DESIGN

REVISIONS	REFERENCE DRAWINGS	PRINT RECORD	ENG. RECORD	DRAWING STATUS
				PRELIMINARY FRR 1/3/94
				PROPOSAL DOC FRR 1/3/94

GENERAL ARRANGEMENT
PLAN @ EL. 70'-0"

BROWARD COUNTY RESOURCE RECOVERY (SOUTH) FACILITY

SCALE 1/16" = 1'-0"

AMERICAN REF-FUEL

ORDER NO. C27971

DWG. NO. 11-00-001

SHEET NO. 004

REV. P

FIGURE 3.2.1.5

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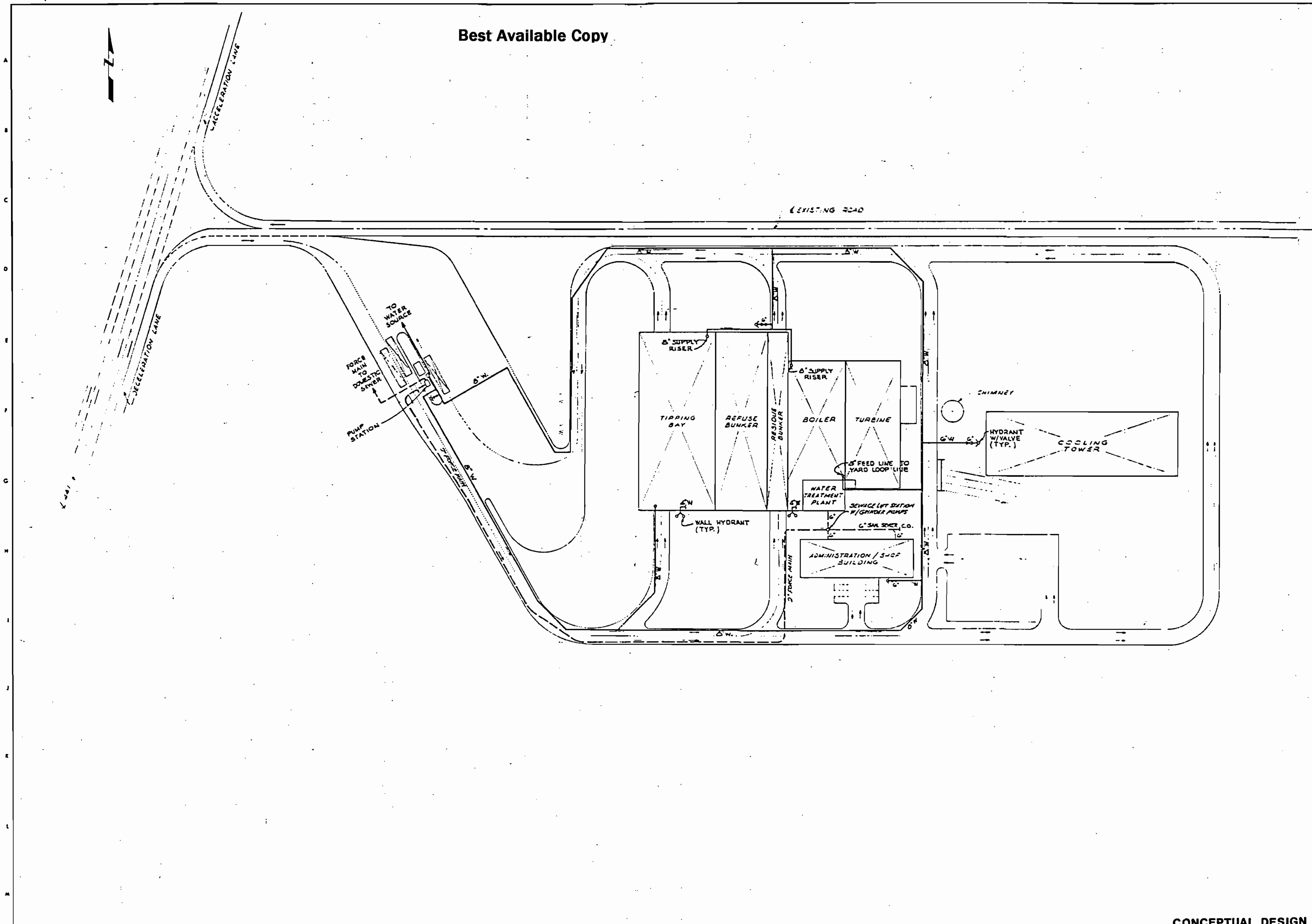


CONCEPTUAL DESIGN

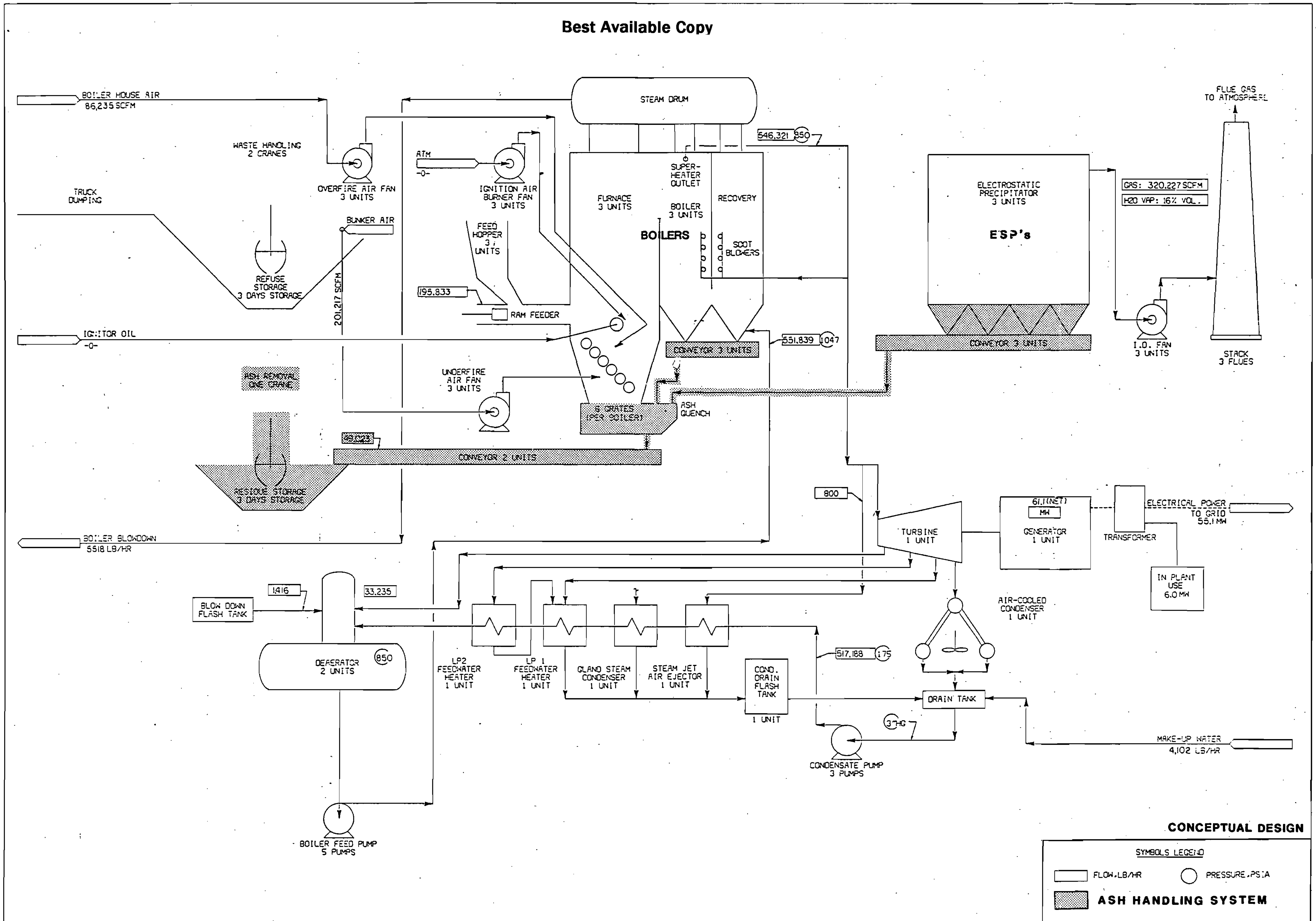
CIVIL UTILITY PLAN

BROWARD COUNTY RESOURCE (SOUTH) FACILITY

1" = 50'

C-27971

FIGURE 3.2.1.6



NOTES:

1. WASTE HEATING VALUE = 5000 BTU/LB.
2. 3 BOILERS AT FULL THROUGHPUT.

REVISIONS | REFERENCE DRAWINGS | PRINT RECORD | ENG. RECORD | DRAWING STATUS

PRELIMINARY PRR
PROPOSAL DWG PRR

PROCESS FLOW DIAGRAM

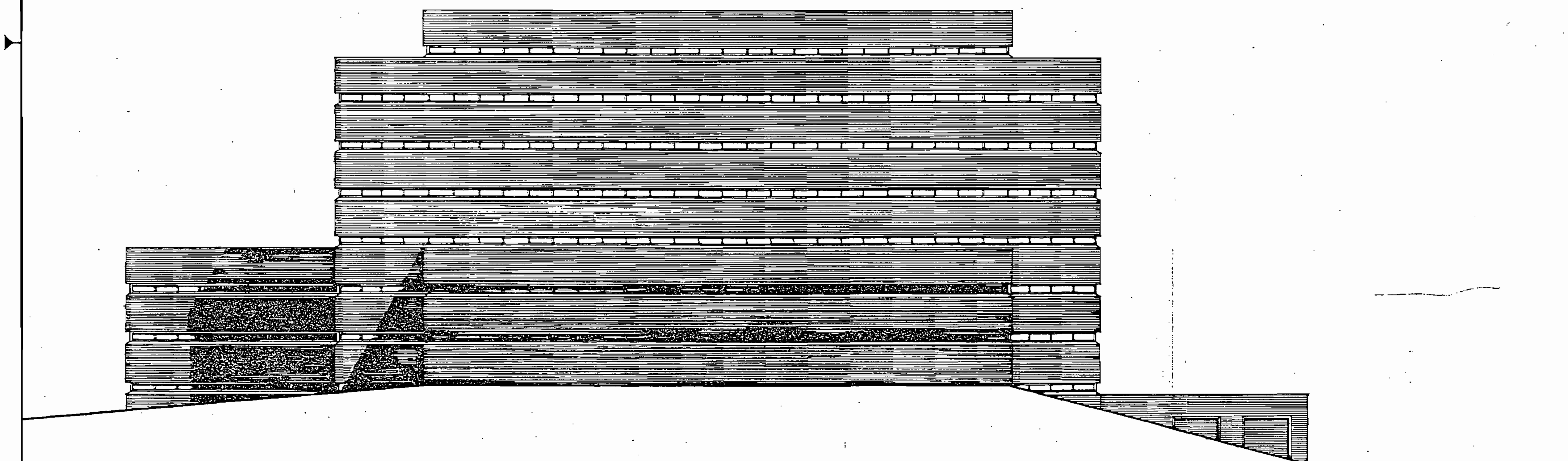
BROWARD COUNTY RESOURCE RECOVERY (SOUTH) FACILITY

SCALE: NONE

AMERICAN REF-FUEL

C27971

FIGURE 3.2.1.7



EAST ELEVATION SCALE 1/16"=1'-0"

NO.	REVISIONS	MADE	CKD.	DATE	NO.	REVISIONS	MADE	CKD.	DATE	DRAWING NO.	REFERENCES

GRAPHIC SCALE

SCALE AS NOTED
DESIGN BY: 10.22.84
DRAWN BY: 10.22.84
CHECKED BY:
SUPV. BY:
SUBMITTED BY:
APP'D BY:
APP'D BY:
APP'D BY:

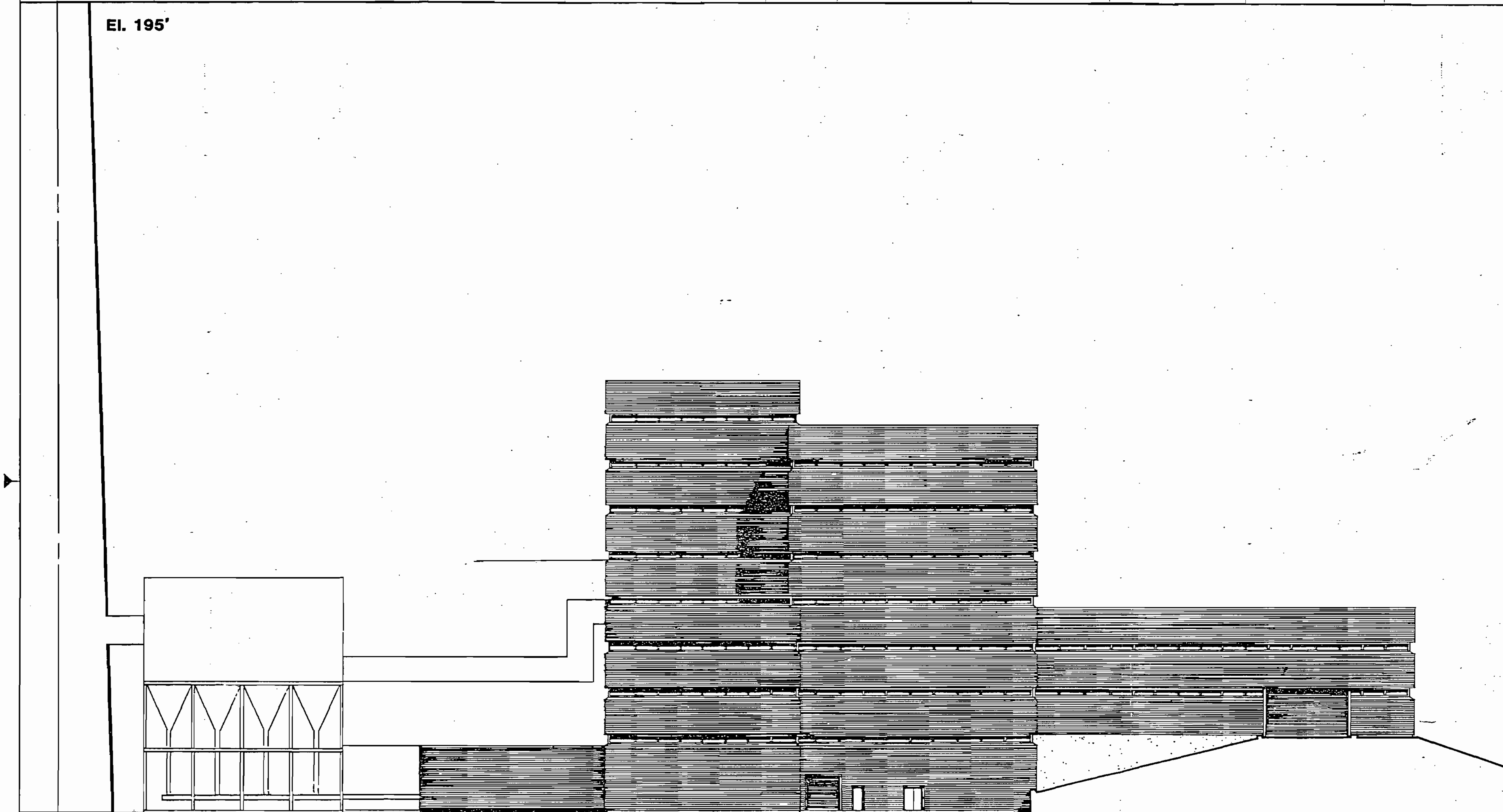
BROWARD COUNTY RESCO
ELEVATIONS
SOUTH SITE

SIGNAL RESCO
Danvers, Massachusetts

Rust International Corporation
CONTRACT 21-P707-84
BIRMINGHAM ALABAMA

DRAWING NUMBER 01-24-003

REV. NO. A



NORTH ELEVATION SCALE 1/16"=1'-0"

NO.	REVISIONS	MADE	CKD.	DATE	NO.	REVISIONS	MADE	CKD.	DATE

DRAWING NO. | REFERENCES

GRAPHIC SCALE

SCALE AS NOTED
DESIGN BY: 10-18-84
DRAWN BY: 10-18-84
CHECKED BY:
SUPV BY:
SUBM'TD BY:
APP'D BY:
APP'D BY:
APP'D BY:

BROWARD COUNTY RESCO
ELEVATIONS
SOUTH SITE

SIGNAL RESCO
Danvers, Massachusetts

Rust International Corporation
CONTRACT 21-P707-84
BIRMINGHAM ALABAMA

DRAWING NUMBER 01-24-001

REV. NO. A

- The landfill will be developed just north of the City of Fort Lauderdale Compost Site (under construction since January, 1985).
- The landfill will require approximately 150 acres to develop.

Figure 2.1.1, Conceptual Development and Environmental Enhancement (Site Plan) provides details concerning the development of the southern landfill.

The project will consist of two landfill cell areas, attendant facilities for water management, and on-site mitigation adjacent to the South Fork New River Canal. The location of the proposed fill areas, landfill cell numbers 1 and 2, and their proposed final fill elevations are shown on the site plan. Ash residue from the resource recovery facility, consisting of less than 4.0 and 0.3 percent by weight of combustible and putrescible matter, respectively, will be landfilled as cover material for intermediate lifts. Earth and fill materials will be transported from off-site locations, as required.

As mentioned, the landfill is bounded by a composting facility for the City of Fort Lauderdale (under construction) to the south, by U.S. Route 441 to the west, by U.S. Route I-595 right-of-way to the north, and to the east by the proposed Ann Kolb Park and the South Fork New River Canal.

The project site is located adjacent to the South Fork New River Canal (Canal C-11) in tidal waters downstream from SFWMD Pump Station S-13. This station is regulated to provide flood control in upstream reaches as well as maintain adequate groundwater elevations to mitigate salt water migration. Annual average water elevations measured downstream of Pump Station S-13 range between elevation +1.64 (flood tide) and elevation -0.02 (ebb tide), relative to mean sea level (MSL).

Although a wetlands area is located in the eastern portion of the site, discussions with the U.S. Corps of Engineers

(USCOE) indicate that this wetlands area has no special significance in terms of environmental habitat or species. Broward County has proposed designating the area to the north-east of the selected site as an Urban Wilderness Area for the preservation of the existing vegetation and habitat. The proposed landfill has been situated to provide for substantial buffers between the facility and the proposed urban wilder-ness area, the South Fork New River Canal and the proposed habitat enhancement area. As shown in Figure 2.1.1, a 200 to 300-foot band of habitat enhancement is located along the eastern perimeter of the site. Enhancement in this area includes the removal of existing dredge spoils and exotic vegetation and the development of swamp and marshlands by planting such species as cypress, sawgrass and pickerelweed.

Access to the landfill cells will be from the Resource Recovery Plant Site on the western perimeter paved access road which will also serve as a dike to prevent on-site runoff from impacting off-site areas. Measures to restrict access to the site will be the determined by the selected vendor. However, as a minimum, the project site will have perimeter fencing and a gatehouse at the main entrance to the site.

The surface water management system for the landfill site is designed to accommodate current and future site utiliza-tion. A detailed description of the surface water management system is provided in Section 3.8, On-Site Drainage System. Generally, stormwater runoff from active areas within a land-fill subcell will be treated as if it were leachate and conveyed to a common sump in the pumping station before ultimate disposal at the Hollywood Wastewater Treatment Plant. Stormwater runoff from inactive areas will be captured in the perimeter swale system and conveyed by culverts to a storm-water retention pond established at the eastern portion of landfill Cell No. 2. During peak storm periods, discharge via stormwater outfall diversion structures to the South Fork New

River Canal will supplement the retention pond capacity for flood control purposes. The pump station located south of Cell No. 2 will pump leachate to the Hollywood Wastewater Treatment Plant. The pump station has separate facilities for collecting and pumping leachate and future stormwater runoff. The discharge will meet any pretreatment requirements of the plant but no pretreatment is anticipated to be need at this time.

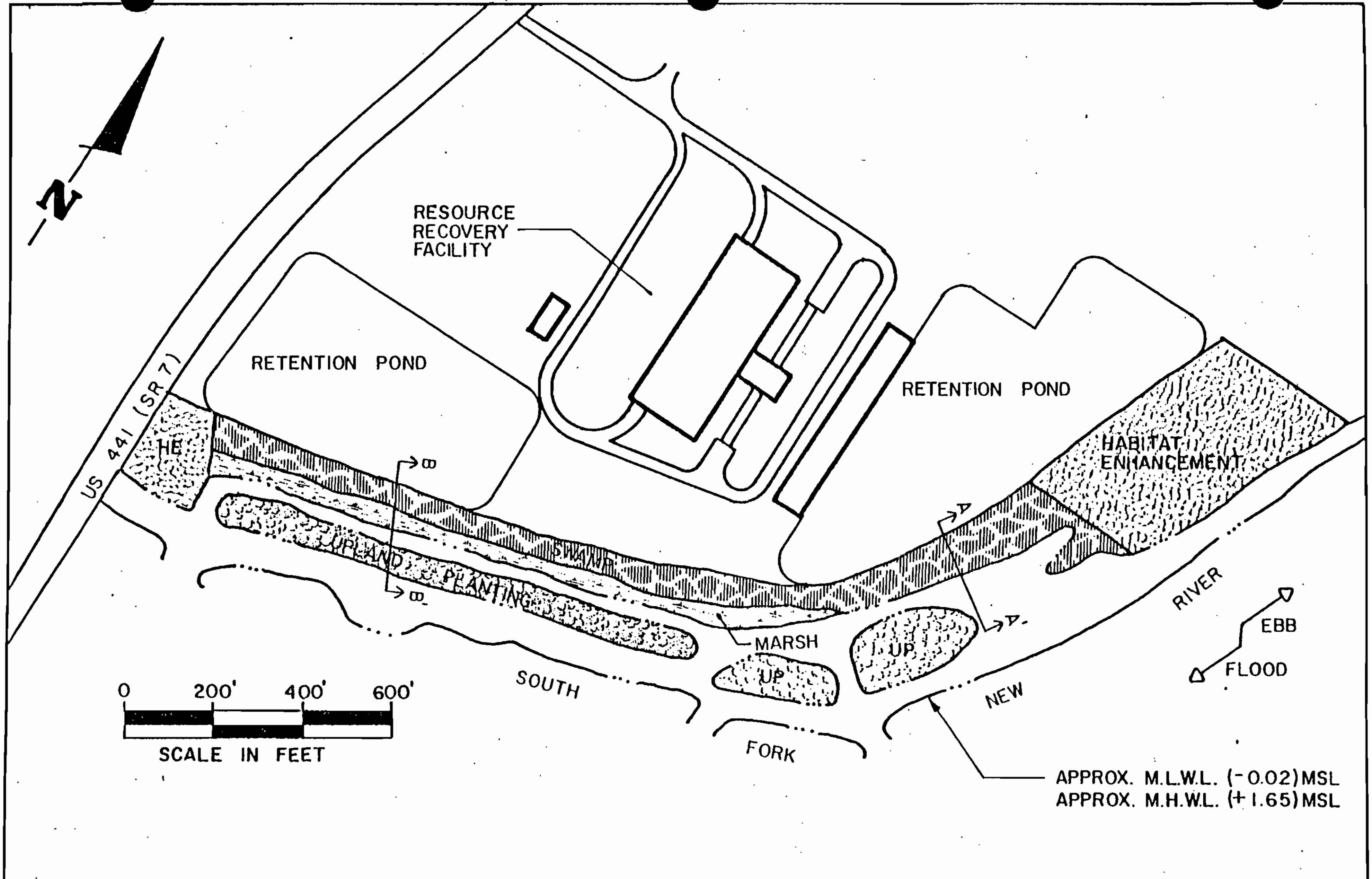
Monitoring well clusters for monitoring the water quality impact of the landfill cells will be provided and are described in the hydrogeologic program presented in Section 5.3, Impacts on Water Supplies.

3.2.3 Habitat Enhancement

As part of the resource recovery facility and residuals landfill, habitat improvement both on and off-site will be implemented to compensate for any loss of existing wetlands. This improvement is an integral part of the project and will be accomplished in the prescribed manner to assure the existing biological integrity of the area is maintained. Figures 3.2.3.1 through 3.2.3.6 illustrate the major elements of the mitigation and habitat enhancement plan for both the area around the resource recovery facility and unprocessable ash/residue landfill.

Major elements:

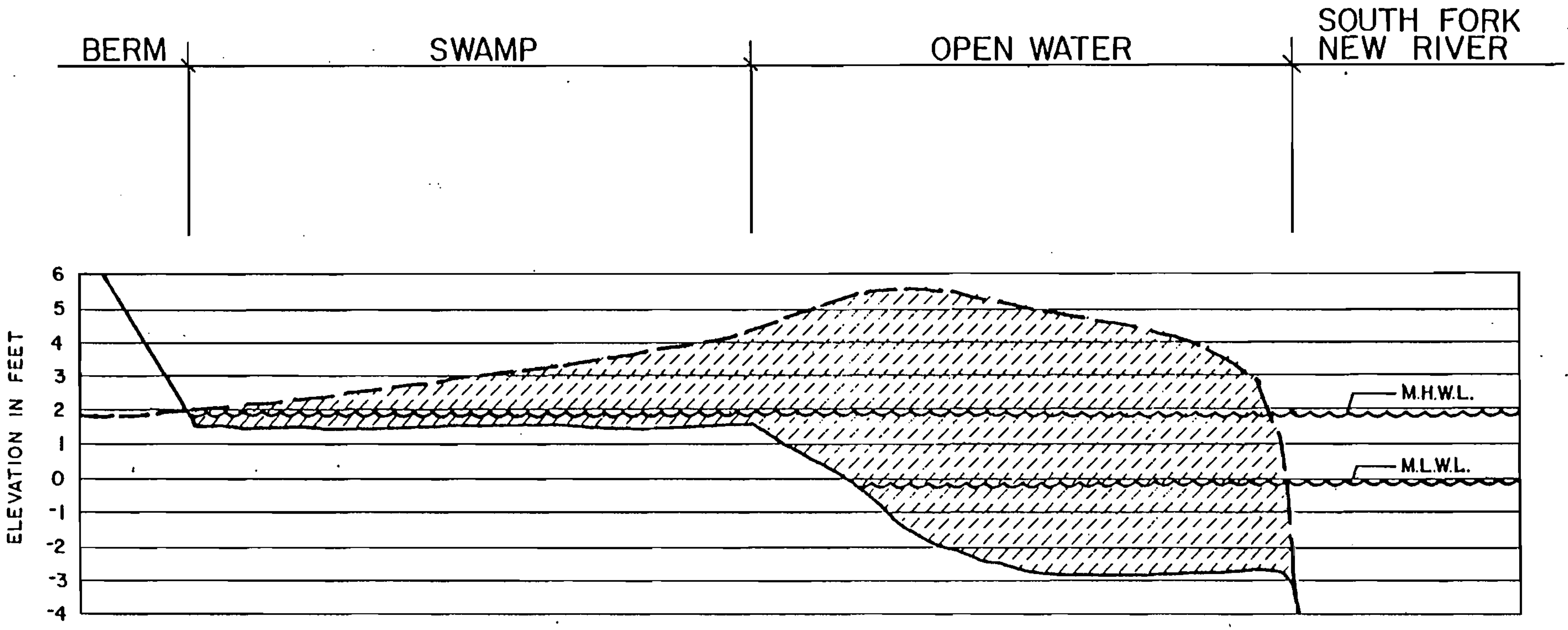
- Removal of parts of dredge spoil berms and associated exotic vegetation.
- Reshaping the land to establish more valuable wetland habitat.
- Planting of marsh and swamp species originally extant in the New River Swamp.
- Controlling exotic species until the plantings become well established.



MITIGATION SITE PLAN

SOUTHERN BROWARD RESOURCE RECOVERY FACILITY

FIGURE 3.2.3.1



EXISTING ELEVATION

FINAL ELEVATION

AREA OF EXCAVATION

APPROX. M.H.W.L. (1.65) MSL

APPROX. M.L.W.L. (0.02) MSL

ALL FINAL SLOPES 3:1

VERTICLE SCALE 1" = 5'0"

0 1' 2' 3' 4' 5' 10'

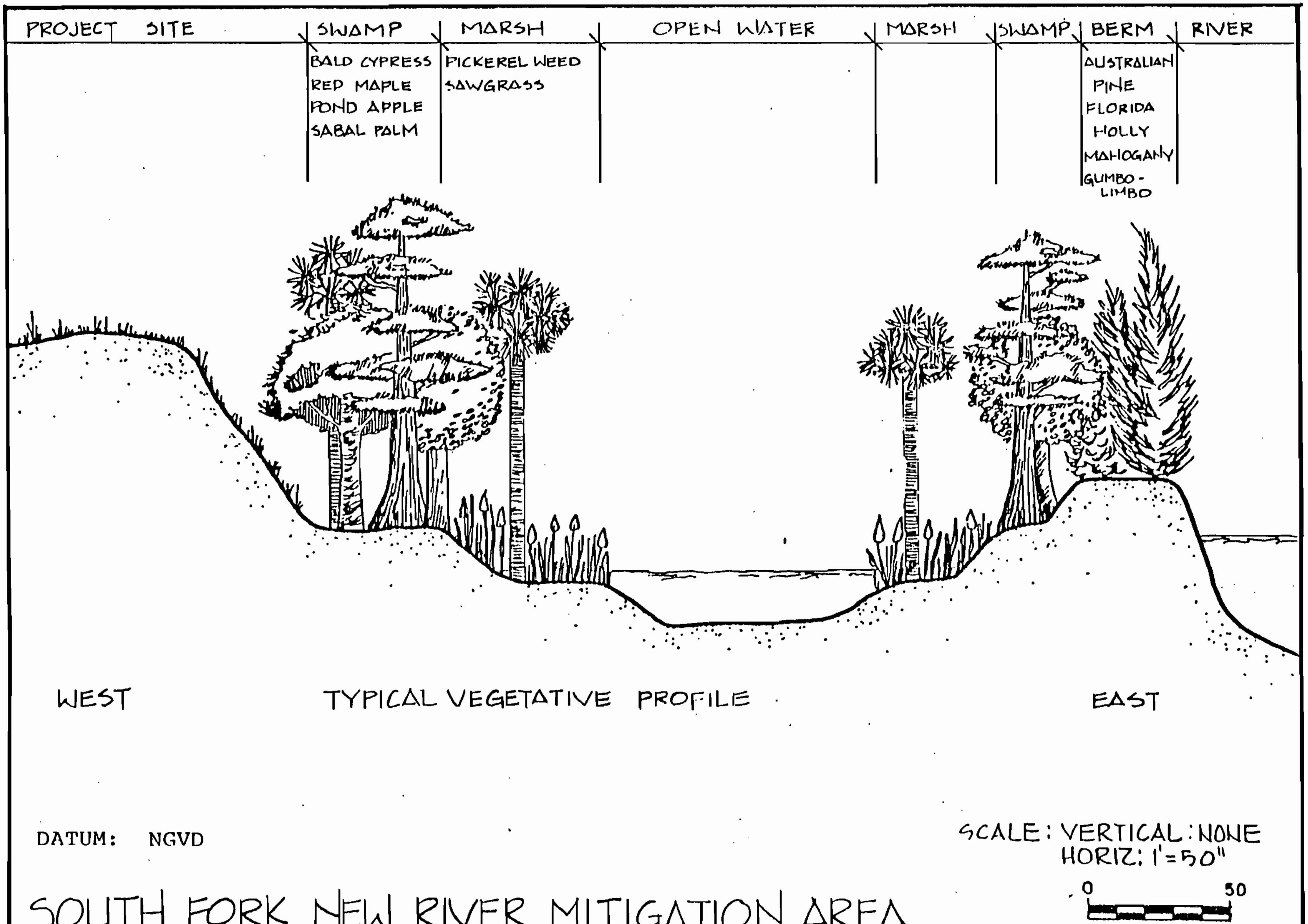
HORIZONTAL SCALE 1" = 30'0"

0 10' 20' 30' 60'

MITIGATION AREA SECTION A-A'

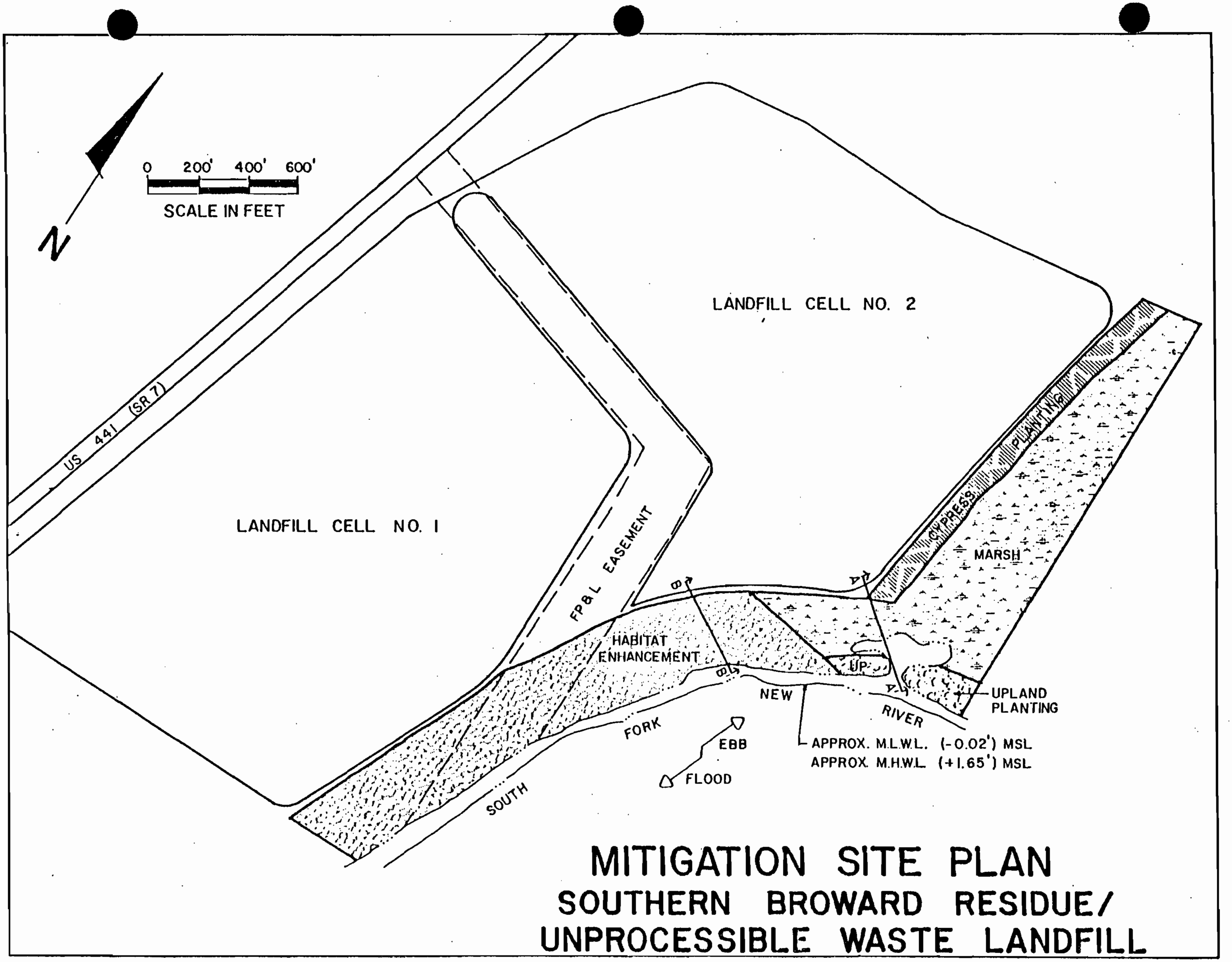
SOUTHERN BROWARD RESOURCE RECOVERY FACILITY

FIGURE 3.2.3.2



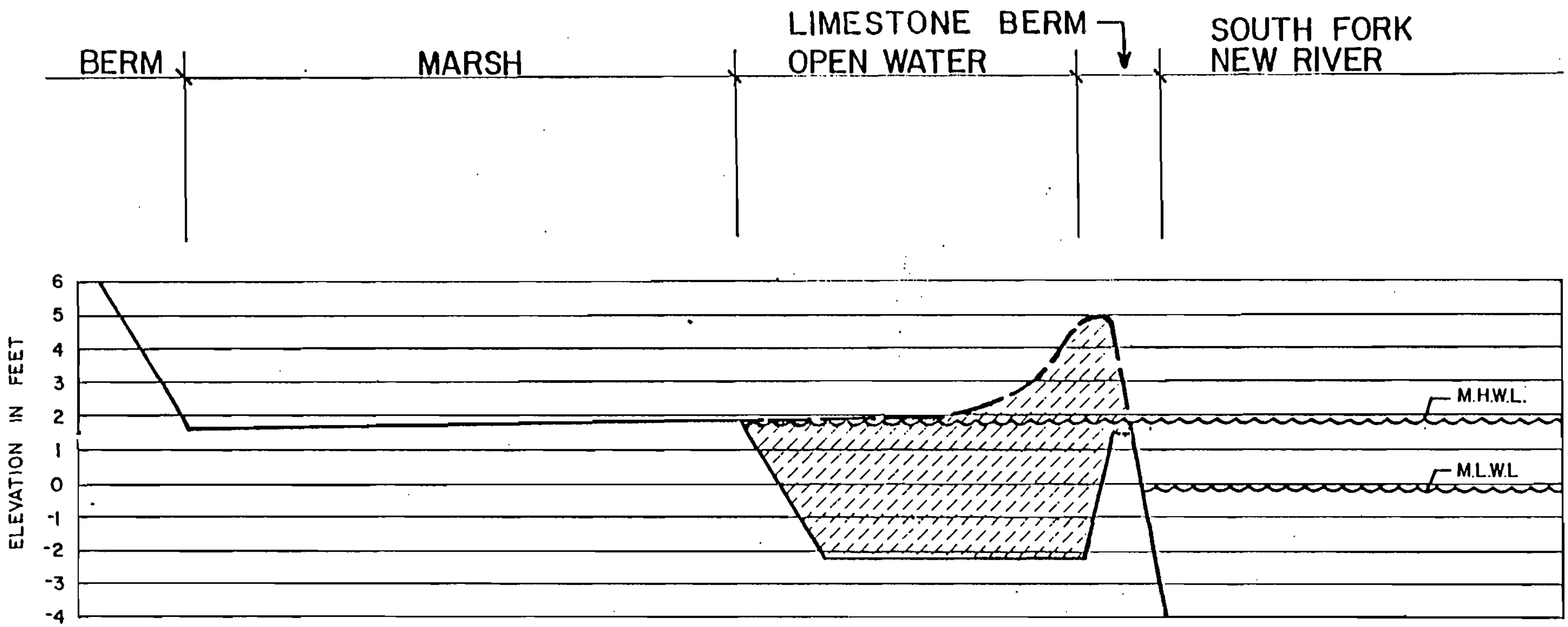
SOUTH FORK NEW RIVER MITIGATION AREA

FIGURE 3.2.3.3



MITIGATION SITE PLAN
SOUTHERN BROWARD RESIDUE/
UNPROCESSIBLE WASTE LANDFILL

FIGURE 3.2.3.4



EXISTING ELEVATION

FINAL ELEVATION

AREA OF EXCAVATION

APPROX. M.H.W.L. (+1.65) MSL

APPROX. M.L.W.L. (-0.02) MSL

ALL FINAL SLOPES 3:1

VERTICLE SCALE 1" = 5'0"

0 1' 2' 3' 4' 5' 10'

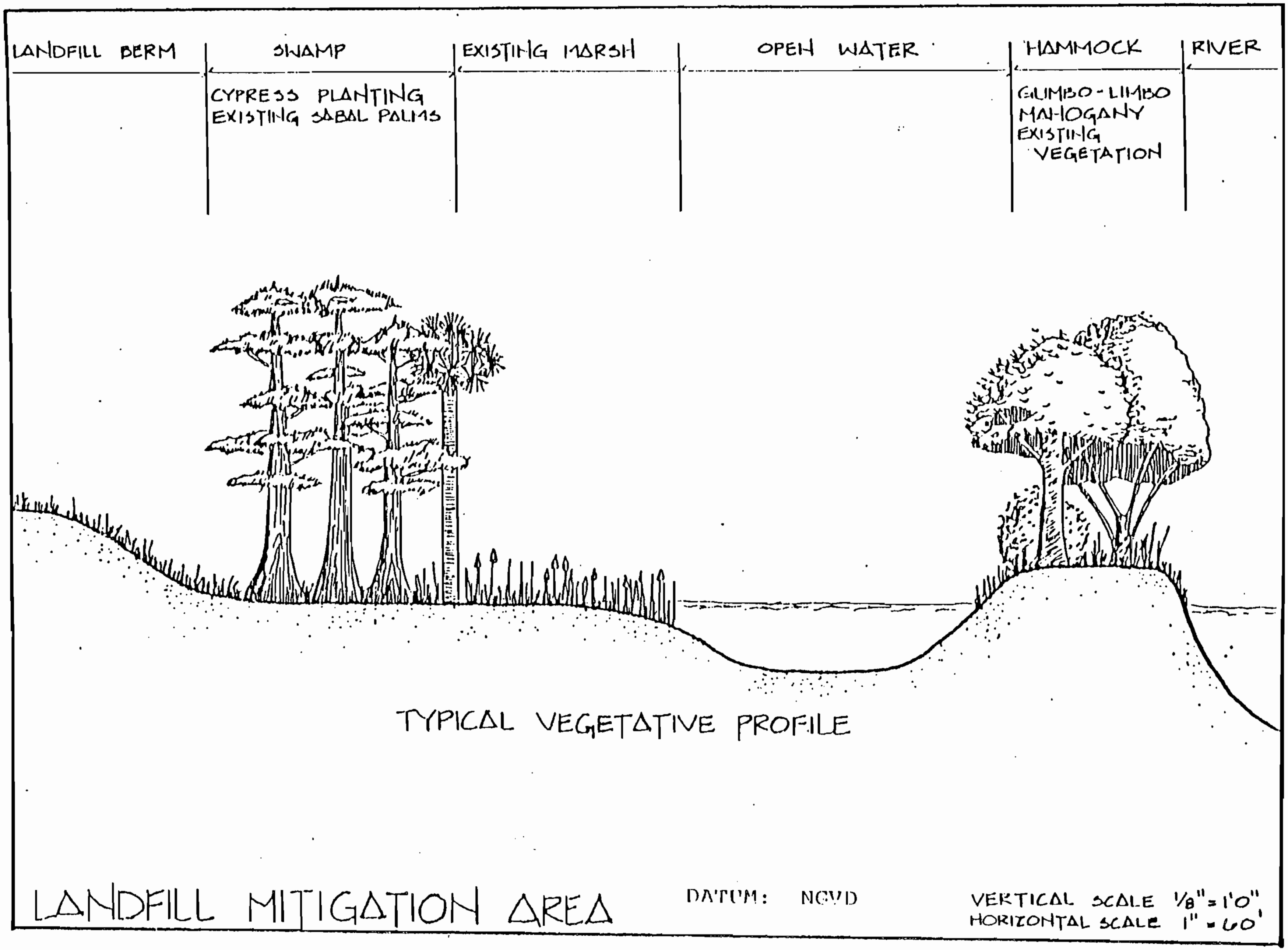
HORIZONTAL SCALE 1" = 60'0"

0 20' 40' 60' 120'

MITIGATION AREA SECTION A-A'

SOUTHERN BROWARD RESIDUE/UNPROCESSIBLE WASTE LANDFILL

FIGURE 3.2.3.



LANDFILL BERM
SWAMP
EXISTING MARSH
OPEN WATER
HAMMOCK
RIVER
CYPRESS PLANTING
EXISTING SABAL PALMS
GUMBO-LIMBO
MAHOGANY
EXISTING VEGETATION
TYPICAL VEGETATIVE PROFILE
LANDFILL MITIGATION AREA
DATUM: NGVD
VERTICAL SCALE 1/8" = 1'0"
HORIZONTAL SCALE 1" = 60'

FIGURE 3.2.3.6

- o Preservation of existing wetlands through purchase of off-site wetland acreage.

- o Enhancement of off-site wetlands.

3.2.3.1 Resource Recovery Facility Mitigation

Development of the resource recovery facility will require about 15.6 acres of wetlands to be removed and filled. On-site mitigation/enhancement will be accomplished using a 15 acre strip adjacent to the South Fork New River Canal (see Appendix 10.7). This mitigation will extend the riverfront natural area from the south end of the proposed Urban Wilderness Area 200 feet wide south to the U.S. Route 441 bridge.

The first phase of the mitigation plan entails environmental enhancement by removing the discarded construction materials and equipment which litter the area. The other major elements of the on-site mitigation plan include:

- o Removal of parts of the dredge spoil berm and associated exotic vegetation.

- o Reshaping the land to establish more valuable wetland habitat similar to that which originally occurred adjacent to New River including: (1) swamp at or above average high water level; (2) marsh between average high water level and average low water level; and, (3) shallow water at depths two to three feet below mean sea level.

- o Planting marsh and swamp species originally extant in the New River Swamp. Marsh plantings would include species such as pickerel weed, duck potato, sawgrass, etc., and swamp plantings would include species such as cypress, red maple, pond apple, and cabbage palms.

- o Controlling exotic plants such as cajeput, Australian pine, and Brazilian pepper on an as needed basis until the plantings become well established.

The final elevation of the swamp will be slightly above average highwater (+1.65 MSL) and marsh elevation will be slightly below average low water (-0.02 MSL). Open water areas will be excavated to -2.0 MSL. The swamp areas will be planted with cypress, red maple, pond apple, and sabal palms. Marsh areas are expected to quickly regenerate naturally, but they will also be planted with pickerel weed and arrow arum. Barren upland areas will be planted with mahogany and gumbo-limbo to create a hardwood hammock environment in an area presently dominated by Australian pine.

3.2.3.2 Landfill Mitigation

Development of the landfill requires use of 133 acres of wetlands. Mitigation to compensate for any loss of wetlands includes both on and off-site work.

3.2.3.3 Landfill On-Site Mitigation

On-site mitigation include the preservation and enhancement of 33 acres of the proposed urban wilderness area (see Appendix 10.7). The area east of landfill Cell 2 will be preserved as a buffer between the landfill and the cypress swamp to the east and a 50-foot strip adjacent to the landfill berm will be planted with cypress trees. A small lagoon connecting with the South Fork New River Canal will be excavated from the berm in the extreme northeastern corner of the site to provide a shallow open water habitat. This work will enhance the adjacent wetlands on an intermittent basis. Flooding, a natural phenomenon which is part of floodplain wetland ecology, has been prevented by the berm of spoil which was placed beside the river when it was dredged. A sill will be left in the mouth of the lagoon to maintain water levels at or near +1.5 MSL, thereby reestablishing a more favorable hydrologic regime in this portion of the New River Flood Plain.

Most of the 300-foot wide strip adjacent to the area will be preserved. It will also be enhanced by: (1) removing an accumulation of trash and discarded construction materials; (2) removing exotic vegetation (Australian pine, Brazilian pepper and cajeput) which is overtaking native vegetation; (3) planting of wetland (cypress, red maple, etc.) and upland (mahogany, gumba limbo, etc.) species in selective locations and (4) routine flooding through the lagoon.

3.2.3.4 Landfill Off-Site Mitigation

In order to augment the on-site mitigation at the landfill, three off-site mitigation areas will be utilized: North New River Canal Mitigation Area (16 acres), Tree Tops Park (15 acres) and the Everglades Restoration Area (74 acres).

3.2.3.5 North New River Mitigation Area

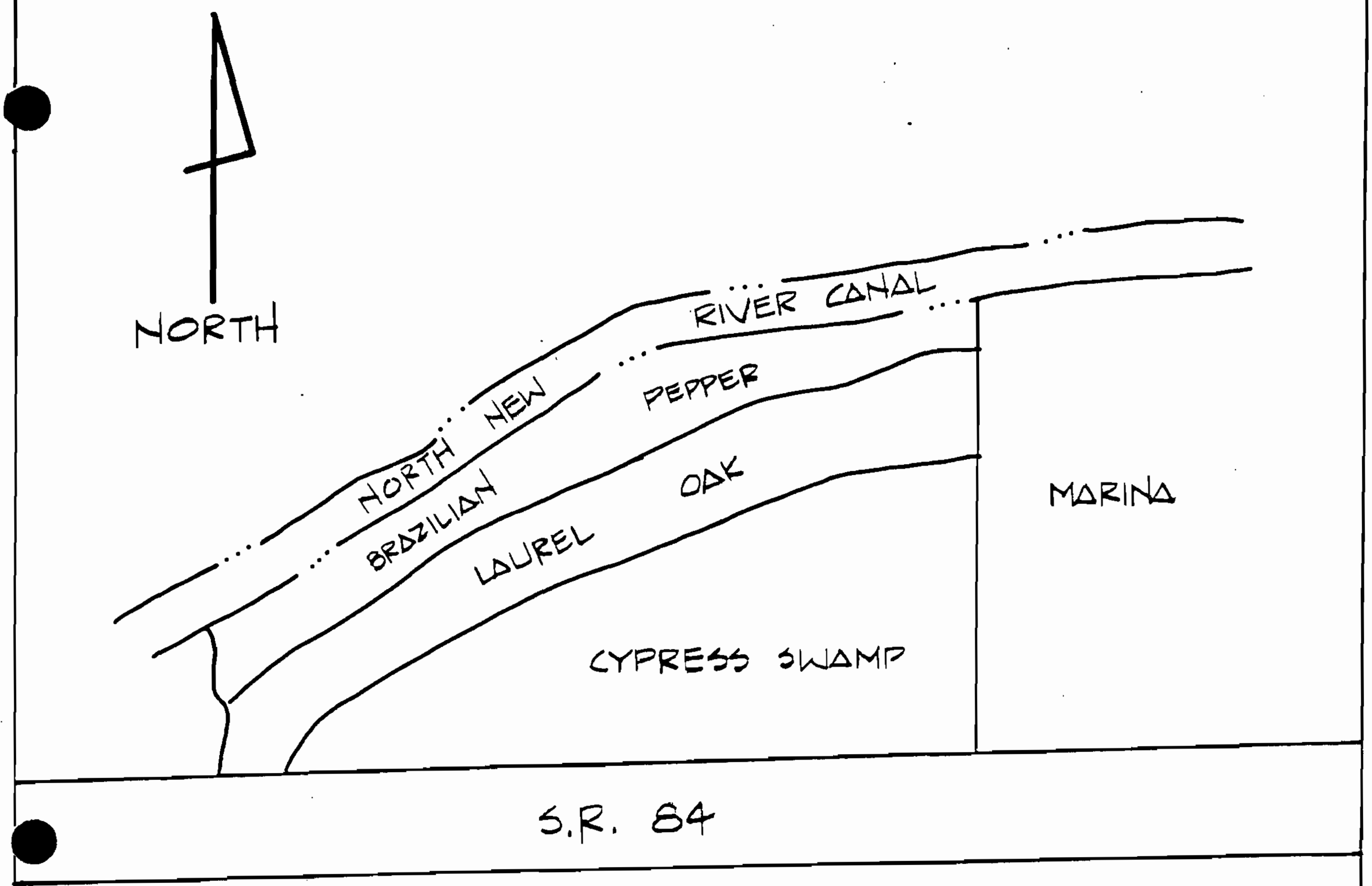
The last remnants of the New River Swamp exist in 3 parcels near the confluence of the North and South Forks. The largest piece (the proposed Ann Kolb Park) is immediately east of the ash residue unprocessable waste landfill (cell 2) and has recently been purchased by Florida Department of Transportation (DOT) as mitigation for I-595. Much of the second remnant piece is within Secret Woods Park, a County maintained nature preserve and educational center. The third parcel is immediately north of State Road 84 and proposed Ann Kolb park and has frontage on North Fork New River and State Road 84 (See Appendix 10.7). This third parcel comprises slightly greater than 20 acres of which 16 has been purchased for project mitigation. Besides large cypress trees typifying southern river floodplains, this site contains what may be the largest remaining stand of native laurel oaks in the County, which adds to the uniqueness of this property (Figures 3.2.3.7 and 3.2.3.8).

Mitigation plans for this site include:

1. Removal of invading Australian pines and Brazilian pepper.

2. Routine maintenance in the site to eradicate Australian pine and Brazilian pepper sprouts and seedlings.

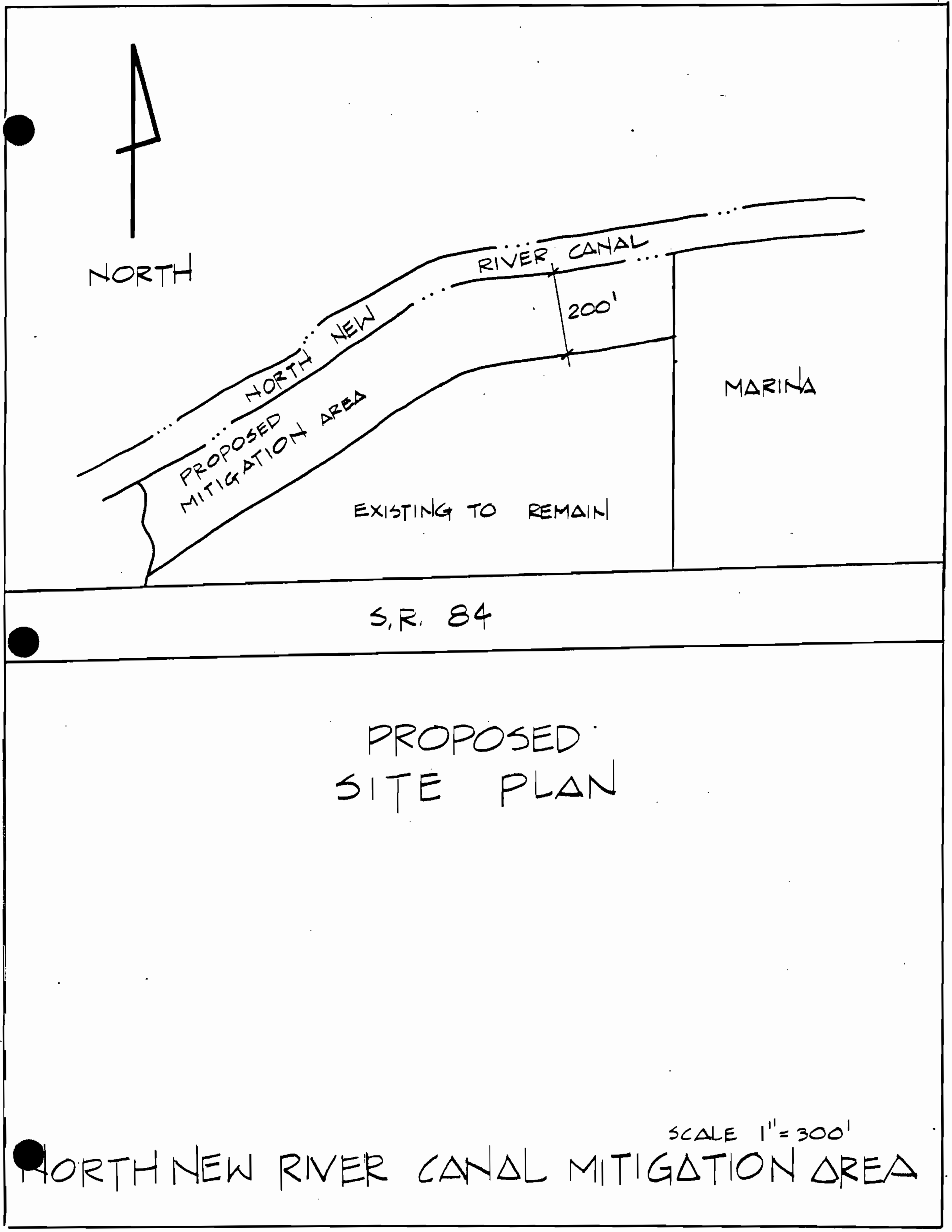
FIGURE 3.2.3.7



EXISTING
SITE PLAN
TOTAL AREA - 16 ACRES

SCALE 1" = 300'

NORTH NEW RIVER CANAL MITIGATION AREA


NORTH
NORTH NEW RIVER CANAL
200'
MARINA
PROPOSED MITIGATION AREA
EXISTING TO REMAIN
S.R. 84
PROPOSED SITE PLAN
SCALE 1" = 300'
NORTH NEW RIVER CANAL MITIGATION AREA

3. Removal of trash piles which occur in the interior of the site.

4. Stabilizing the north side of the fill area which has been placed adjacent to State Road 84.

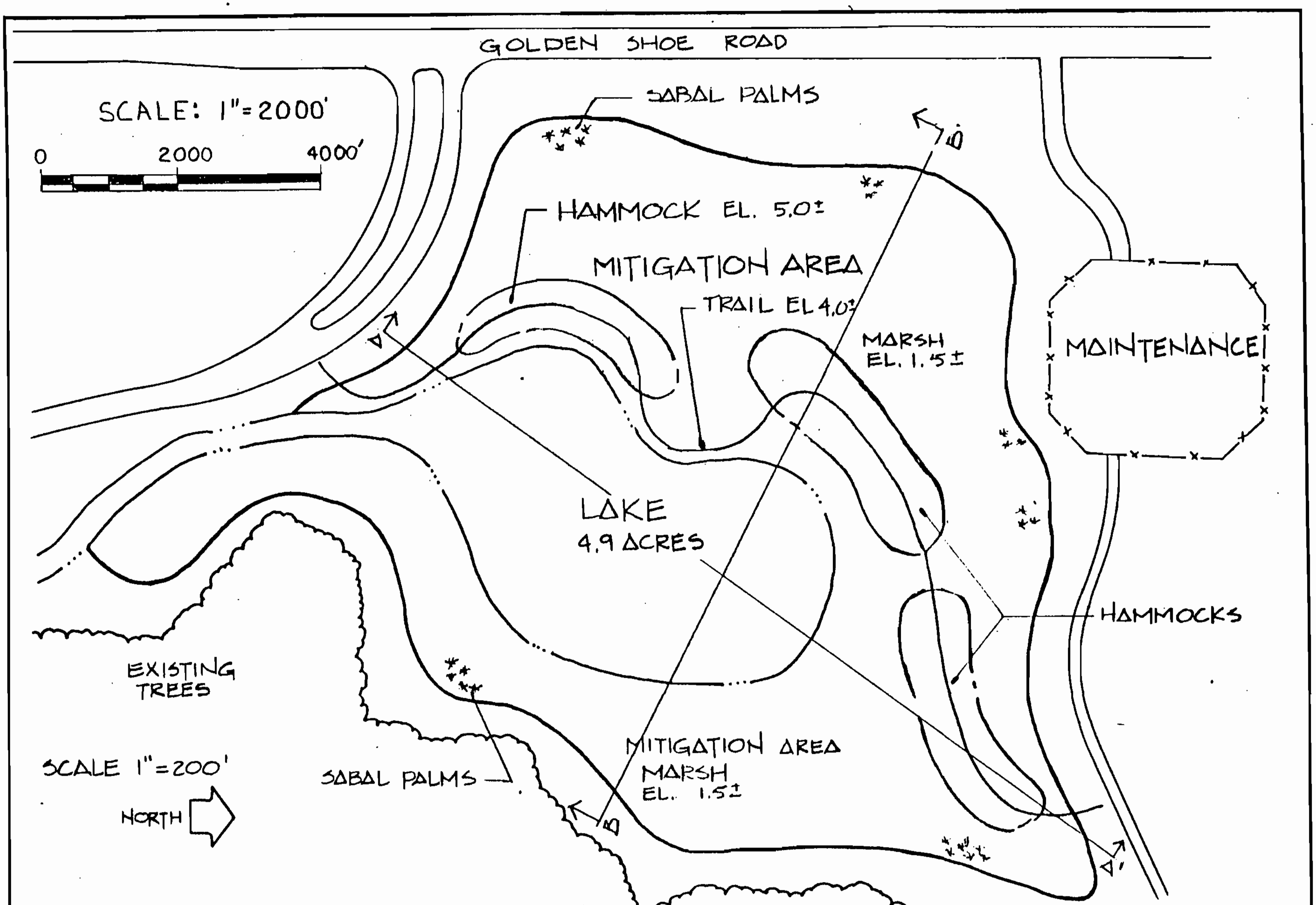
This relatively minor amount of site work will restore the site to a more natural condition and will enhance its functional and aesthetics values.

3.2.3.6 Tree Tops Park Mitigation

Tree Tops Park, a new County facility located at the corner of Orange Drive and Golden Shoe Road also will be used for the mitigation (See Appendix 10.7). The mitigation plans have been developed in close coordination with the Broward County Parks Department. For this project, mitigation entails creating a semi-permanently flooded sawgrass marsh and hardwood hammock from an existing wax myrtle-saltbush shrub thicket (Figure 3.2.3.9). The mitigation area comprises a total of 15.7 acres, 13.5 acres of which will be sawgrass marsh and 2.2. acres of which will be hardwood hammock.

The water level in the pond will be maintained approximately +2.5 feet (MSL) although the water level may occasionally rise to +3.0 feet during wet periods because the park is within one of SFWMD's retention areas. Marsh habitat will be created around the lake by lowering the surrounding area's elevation. Essentially, the edge of the lake will be a broad, shallow marsh with several tree islands (hammocks). The topography of the marsh area will range from +1.5 to +3.0. Hammocks will be at a slightly higher elevation (+5.0). Except on hammocks, the trail will be at (+4.0) and will incorporate culverts to insure water interchange throughout the marsh.

Creation of 15.7 acres of marsh and hammocks in Tree Tops Park provides a mitigation area which will result in a high quality wetland/open water/hammock environment similar to the



TREE TOPS PARK MITIGATION AREA SITE PLAN

FIGURE 3.2.3.9

Everglades. Besides serving as a more valuable functioning wetland, the Tree Tops Park area will provide a valuable educational opportunity for the people of Broward County.

3.2.3.7 Everglades Restoration Area Mitigation

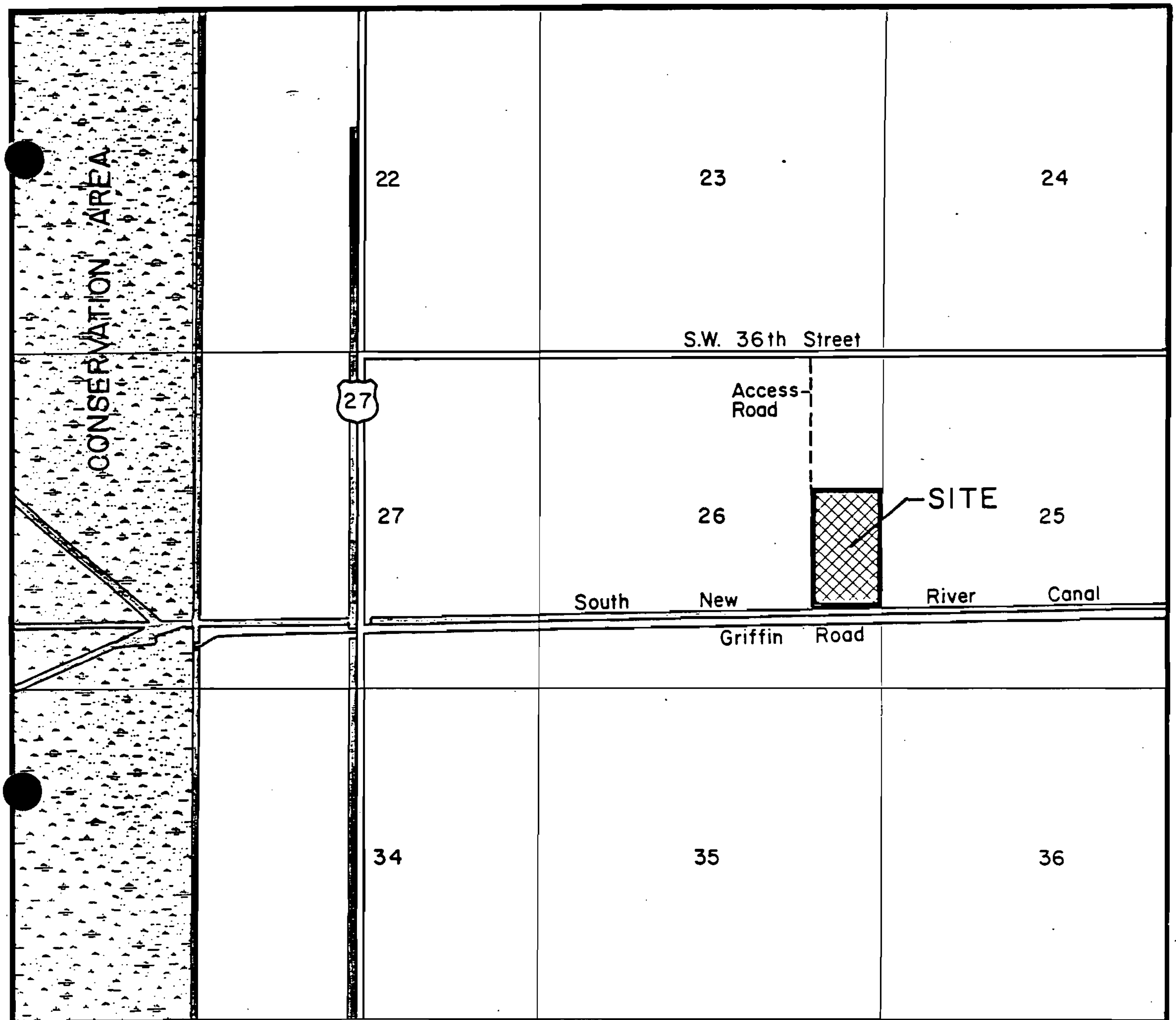
The largest mitigation site (74 acres) for the landfill is the Everglades Restoration Area, located immediately north of south New River Canal and Griffin Road, approximately 1-1/4 miles east of U.S. 27 (Figure 3.2.3.10). This site is former Everglades marsh which is no longer flooded. The site has been impacted by drainage on all sides, but Everglades conditions will be restored by reflooding the site. The site has been reviewed by biologists from South Florida Water Management District (SFWMD), U.S. Fish and Wildlife Service (USFWS), Florida Game and Freshwater Fish Commission, (FGFWFC) and U.S. Environmental Protection Agency. All agencies concur that a viable, functioning marsh can be recreated at this 74 acre site.

Specific restoration methodology is currently being studied in a joint planning effort with the project consultants and SFWMD, FGFWFC, and USFWS. Current plans are to berm the site and flood it by pumping.

This site provides a unique opportunity to reclaim Everglades habitat which is rapidly disappearing east of the conservation area. The area will function as a water retention area, wildlife and fish habitat, and recreational and educational area. Deed restrictions will ensure that it will remain as wetlands in perpetuity for the people of Broward County.

Mitigation at these three areas as well as on site enhancement fulfills the requirement to offset wetland losses associated with project development. Acquisition, mitigation and enhancement activities, and maintenance work to keep exotic vegetation from becoming reestablished will ensure that all mitigation areas will remain productive and viable wet-

FIGURE 3.2.3.10



— SITE LOCATION MAP —

EVERGLADES RESTORATION AREA

SITE DATA

- 74 ACRES
- SECTION 26, TOWNSHIP 50 S, RANGE 39 E
- AGRICULTURAL ZONING
- INDIAN TRACE DRAINAGE DISTRICT

0 1000' 3000'

Scale in Feet

CZR, INCORPORATED
1001 U.S. HIGHWAY 1
JUPITER, FL 33458

lands. The mitigation work will preserve a valuable but disappearing resource for the people of Broward County.

In consideration of all factors, the approved mitigation plan results in: 1) one-to-one replacement of wetlands lost; 2) produces wetlands of greater overall value per unit area than those lost to development; 3) satisfies requirements of regulatory agencies; 4) consistency with the County's Parks and Recreation Division Master Plan and 5) provides beneficial environmental, social and recreational values to the people, wildlife and water resources of Broward County. A more detailed discussion of the South Broward County Resource Recovery Project Mitigation Plan can be found in Appendix 10.7.

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 municipal solid waste is simply that portion of the total incoming waste stream to the facility that can be burned in stoker fired furnaces and waterwall 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.

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 a committee of 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 1983.

LANDFILL WASTE QUANTITIES (1981-1983)
(TONS PER DAY)

	Central Disposal Landfill		Davie Landfill		Out of County	
Year	Garbage	Trash	Garbage	Trash[2]	Waste[1]	Total
1981	1430	540	660	310	(300)	2640
1982	1540	440	630	260	(300)	2570
1983	1660	490	860	310	(300)	3020

1. For the purpose of this project, the amount of waste delivered from adjacent Palm Beach County is estimated to be approximately 300 TPD, and it is deleted from Broward County waste totals.

2. 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 1983.

Discussions with officials from adjacent Palm Beach County indicate that a portion of their waste is disposed of at the Central Disposal landfill. For the purpose of this analysis the amount of waste delivered from adjacent Palm Beach County has been estimated to be approximately 300 tons per day (tpd). Since this waste cannot be controlled by Broward County, it is deleted from the waste disposal quantities required for the Project.

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. The tabulated figures are based upon 1981 weigh scale data and volume estimates at the Broward County sanitary landfill.

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.

MONTHLY VARIATION OF SOLID WASTE

Month	Percent of Average 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.

Based on a 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 was compiled on garbage and trash:

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

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 3.3.1 and 3.3.2. 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.

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 Contractor 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.

TABLE 3.3.1

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 3.3.2

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

Again, the Contractor will be responsible for accepting the County's waste at the facilities in accordance with the normal collection and delivery practices of the County and the Contract Communities. The County has no duty to levelize deliveries during the day.

3.3.7 Population Projections

Total 1981 population for the County was 1,052,020, as reported by the League of Cities, Broward County and the Broward County Office of Planning. The University of Florida 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 determined that it will provide a put-or-pay commitment of 1,700 tpd for the Project.

Based upon a system availability factor of 0.85 to account for scheduled and unscheduled downtime and to accommodate peak seasonal variations, the minimum Nameplate Capacity required in 1989 at the southern resource recovery facility will be 2,000 tpd. Recognizing that vendor facilities come in different unit sizes and that optimum configurations may dictate different capacities at each of the two resource recovery facilities, the County is somewhat

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.

flexible with regard to facility size configurations. Based upon the facility capacities proposed by the prequalified vendors, this certification application has been based on a maximum initial installed capacity of 2,352 tpd and a projected ultimate capacity of approximately 3,300.

3.3.9 Residue and Unprocessable Waste Disposal

The facility will include a residue/unprocessable waste landfill for the disposal of residue generated by the Project and unprocessable waste that cannot be incinerated at the resource recovery facility. This landfill will conform to all applicable laws and regulations. At no time will processable waste be disposed of at this landfill, except to the extent that it is contained in the normal unprocessable waste stream. The residue will be transported to the residue/unprocessable waste landfills in compliance with all applicable codes, rules, and laws regulating such material and its transportation.

At the Route 441 site, initial cellular development will begin in the southwestern quarter of cell 1, as shown on Figure 2.1.3, Proposed Landfill Design. Cellular development shall include the installation of a non-pervious liner system (double liner), leachate collection system (porous material and leachate collection piping), contingency collection system, berms, swales, stormwater piping, and sufficient temporary stormwater retention to satisfy SFWMD requirements. A detailed discussion on landfill design is provided in Section 5.3, Impacts on Water Supplies.

The County will monitor the delivery of waste to the Project to ensure that Processable and Unprocessable Wastes are directed to the proper disposal areas.

Hazardous wastes shall not be accepted at the facility. Any hazardous wastes inadvertently accepted at the Resource Recovery Facility or at the Residue/Unprocessable Waste landfill shall be properly stored and disposed of off-site.

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

3.4 Air Emissions and Controls

3.4.1 Air Emission Types and Sources

The proposed project consists of a resource recovery facility which will have initial and maximum (or ultimate) installed capacities of 2,352 and 3,300 tpd, respectively. The data presented in this report are based on preliminary or conceptual design of the proposed facility. The design will be subject to certain refinements following selection of a full-service vendor. 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. The assumptions used in estimating the exit gas flow rate for modeling purposes were conservative because:

1. A lower percent of carbon (29 percent) was used in the calculations rather than higher percentages obtained from ultimate analysis tests, and

2. Only 60 percent excess air was considered (excess air for normal operation is between 80 and 120 percent).

The solid waste charging rate and location of the proposed facility are presented in Table 3.4.1.1. The stack and operating parameters for the projected initial and maximum capacities (i.e., 115 percent of nameplate) of the facility considered in the air quality modeling are presented in Table 3.4.1.2. The proposed stack height for the facility will be 195 feet above grade. This stack height represents the maximum height that can be used to ensure compliance with applicable Federal Aviation Administration (FAA) regulations.

TABLE 3.4.1.1

SOLID WASTE CHARGING RATE AND LOCATION OF THE PROPOSED FACILITY

Parameter		Value
Solid Waste Charging Rate		
Nameplate Capacity--Initial		2,352 TPD (98.0 tph)
Maximum		3,300 TPD (137.5 tph)
Projected Capacity--Initial	115% of nameplate	2,705 TPD (112.7 tph)
Maximum		3,795 TPD (158.1 tph)
Heat Input Rate*		
Nameplate Capacity--Initial		882.0×10^6 Btu/hr
Maximum		$1,237.5 \times 10^6$ Btu/hr
Projected Capacity--Initial		$1,014.3 \times 10^6$ Btu/hr
Maximum		$1,422.9 \times 10^6$ Btu/hr
Location		
Latitude, Longitude		26.07°, 802.0°
UTM Zone		17
UTM East, North Coordinate		579.6, 2,883.3 km

*Based on average heating value of solid waste of 4,500 Btu/lb.

Source: Malcolm Pirnie, Inc., 1985.

TABLE 3.4.1.2

STACK AND OPERATING PARAMETERS FOR THE PROJECTED CAPACITIES*
OF THE PROPOSED FACILITY CONSIDERED IN THE AIR QUALITY MODELING

Parameter	Value
Solid Waste Charging Rate	
Initial	2,705 TPD
Maximum	3,795 TPD
Heat Input Rate	
Initial	$1,014.3 \times 10^6$ Btu/hr
Maximum	$1,422.9 \times 10^6$ Btu/hr
Stack Height	195 ft (59.4 m)
Stack Diameter	16.5 ft (5.03 m)
Exit Gas Temperature	
Initial	450°F (505°K)
Maximum	450°F (505°K)
Exit Gas Flow Rate	
Initial	691,493 acfm 355,558 dscfm†
Maximum	970,134 acfm 498,832 dscfm†
Exit Gas Velocity	
Initial (used in model)	42.6 ft/s (14.1 m/s)
Maximum (used in model)	65.0 ft/s (19.8 m/s)

*Based on 115 percent of nameplate capacity.
†AT 10-percent CO_2

Note: acfm = actual cubic feet per minute.
dscfm = dry standard cubic feet per minute.

Source: Malcolm Pirnie, Inc., 1985.

The emission factors for the regulated pollutants that will be emitted from the proposed facility are presented in Table 3.4.1.3. For most of the regulated pollutants, the emission factors are based on estimates derived for resource recovery facilities similar in size to the proposed facilities. The emission factors are given as a function of the heat content and amount of solid waste burned. These emissions factors were obtained from Malcolm Pirnie, Inc. and are based on a review of the literature, such as 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 presented in Table 3.4.1.4, and are 115 percent of nameplate capacity.

3.4.2 Air Emission Controls

The State of Florida has received administrative and technical review authority for the federal PSD program. In addition, Florida has passed PSD regulations and BACT requirements similar to EPA. DER defines BACT as follows (CH. 17-2.100(22), FAC):

> An emission limitation, including a visible emissions standard, based on the maximum degree of reduction of each pollutant emitted which the Department, on a case by case basis, taking into account energy, environmental and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques (including fuel cleaning or treatment or innovative fuel combustion techniques) for control of each such pollutant... Each BACT determination shall include applicable test methods or shall provide for determining compliance with the standard(s) by means which achieve equivalent results.

The source applicability analysis for the proposed facilities (see Appendix 10.1.5) identified the following emitted air pollutants as requiring a BACT review under federal and state PSD regulations:

- Particulate Matter (PM)
- Sulfur Dioxide (SO_2)
- Nitrogen Oxides (NO_x)

TABLE 3.4.1.3

POLLUTANT EMISSION FACTORS FOR PROPOSED FACILITY

Pollutant	Emission Factor $lb/10^6$ Btu	Emission Factor lb/ton*
Particulate Matter	0.074	0.67
Sulfur Dioxide	0.55	4.91
Nitrogen Dioxide	0.56	5.0
Carbon Monoxide	0.089	0.80
Volatile Organic Compounds 83.1 T/Y	0.013	0.12
Lead	0.03	0.27
Fluorides	0.025	0.23
Sulfuric Acid Mist	0.0028	0.025
Hydrogen Sulfide	NA	NA
Total Reduced Sulfur	NA	NA
Reduced Sulfur Compounds	NA	NA
Asbestos	NA	NA
Beryllium	9.3×10^{-7}	8.4×10^{-6}
Mercury	0.00026	0.0023
Vinyl Chloride	NA	NA
Benzene	NA	NA
Radionuclides	NA	NA
Inorganic Arsenic	0.000031	0.00028

NA = Not Applicable.
*Based on average heating value of solid waste of 4,500 Btu/lb.

Source: Malcolm Pirnie, Inc., 1985.

TABLE 3.4.1.4

MAXIMUM HOURLY AND ANNUAL AVERAGE EMISSION RATES
FOR THE PROPOSED FACILITY

Pollutant	Initial Capacity = 2,705 TPD*		Maximum Capacity = 3,795 TPD*		PSD Significant Emission Rate (TPY)
	lb/hr	TPY	lb/hr	TPY	
Particulate Matter	75.1	328.8	105.3	461.3	25
Sulfur Dioxide	557.9	2,443.6	782.7	3,428.3	40
Nitrogen Dioxide	568.1	2,488.1	796.9	3,490.6	40
Carbon Monoxide	90.3	395.4	126.7	554.8	100
Volatile Organic Compounds	13.2	57.8	18.5	81.0	40
Lead	30.4	133.3	42.7	187.0	0.6
Fluorides	25.4	111.1	35.6	155.8	3
Sulfuric Acid Mist	2.8	12.3	4.0	17.3	7
Beryllium	0.00094	0.0041	0.0013	0.0058	0.0004
Mercury	0.26	1.4	0.36	1.6	0.1
Arsenic	0.032	0.14	0.044	0.19	0

*These capacities are 115 percent of nameplate capacities which are 2,352 TPD (initial) and 3,300 TPD (maximum).

Source: Malcolm Pirnie, Inc., 1985.

Carbon Monoxide (CO)
Lead (Pb)
Fluorides (F^-)
Beryllium (Be)
Mercury (Hg)
Arsenic (As)
Sulfuric Acid Mist

3.4.2.1 Particulate Matter

Particular matter (PM) generated by the combustion of solid waste will be minimized through combustion controls and boiler design. PM exiting the boilers in the exhaust gases will be controlled by use of electrostatic precipitators (ESPs). The combustion boiler design will be of the mass-burn stoker-fired type and capable of firing as-received solid waste on a continuous-feed basis without auxiliary fuel firing. This boiler design requirement will serve to minimize the generation of ash and, therefore, PM in the furnace.

The exhaust gases of each boiler will pass through an ESP prior to discharge to the atmosphere through a common stack with an individual flue for each boiler. Design details for the ESP are not known at this time. Design details will be supplied to DER as they become available for regulatory review. However, the following minimum criteria will have to be met by the selected manufacturer. Each ESP will be capable of reducing the exhaust gas PM concentration to 0.03 gr/dscf, corrected to 12-percent CO_2, or 0.1 lb/mbtus whichever is less over the range of boiler operating conditions. Opacity of the emissions will not exceed 20 percent. A further discussion of the ESP design can be found in Section 3.4.4

An ESP with an outlet grain loading of 0.03 gr/dscf is considered to represent BACT for the proposed facility, based on economic, energy, environmental, and plant operating considerations. NSPS for new incinerators charging more than 50 TPD of solid waste are applicable to this proposed project

(40 CFR 60, Subpart E). The New Source Performance Standard (NSPS) emission standard limits PM emissions to 0.08 gr/dscf, corrected to 12-percent CO_2. The proposed ESP emission rate is well below this allowable level.

The boilers will be used to generate steam which will drive turbine electrical generators. The boilers will not be subject to the provisions of Subpart D or D(a) of 40 CFR 60, which are the NSPS for fossil-fuel-fired steam generators and electric utility steam generating units, respectively, because solid waste is not a fossil fuel.

State of Florida PM emission-limiting standards require new incinerators with a charging rate of greater than 50 TPD to meet 0.08 gr/dscf, corrected to 50-percent excess air. This standard is similar to the federal NSPS, and the proposed facility will emit PM at a significantly lower rate. State of Florida emission regulations also require an opacity limit of 20 percent, which the proposed facilities will not exceed. The eventual vendor will provide opacity meters to insure compliance (see Appendix 10.11).

Based on USEPA emission factors for municipal incinerators (USEPA, 1983), uncontrolled PM emissions are estimated at 30 pounds per ton (lb/ton) of solid waste fired. USEPA's review of NSPS for incinerators (USEPA, 1979) cites uncontrolled PM emissions in the range of 10 to 70 lb/ton. However, it is noted that these values are for municipal incinerators and may not be applicable to resource recovery units. Nevertheless, if an average value of 30 lb/ton is assumed, the proposed facility, at 115 percent of maximum nameplate capacity (i.e., 3,795 TPD = 115 percent of 3,300 TPD), would generate 4,744 lb/hr of PM. The ESP would then have a PM removal efficiency of at least 97 percent. The proposed ESP maximum PM emission rate will result in a maximum PM emission rate of 105.3 pounds per hour (lb/hr). Assuming an average solid waste heating value of 4,500 Btu/lb, the facility would emit 0.074 $lb/10^6$ Btu of PM. This emission

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142.3

0.10

rate is even less than EPA's proposed revision to NSPS for large steam generating units which would limit PM emissions to 0.1 lb/10^6 Btu.

3.4.2.2 Sulfur Dioxide

The control technology for Sulfur Dioxide (SO_2) of firing low-sulfur fuel in the mass-burn resource recovery facility is proposed as BACT. The proposed BACT emission limit of 4.9 lb SO_2/ton of solid waste fired is equivalent to 782.7 lb/hr or 0.55 lb/10^6 Btu heat input. By comparison, NSPS for fossil- 774.8
0.54 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 solid waste fired boilers.

3.4.2.3 Nitrogen Oxides and Carbon Monoxide

The proposed BACT for Nitrogen Oxides (NO_x) and Carbon Monoxide (CO) emissions is boiler design and good combustion practices. The proposed BACT emission limits are 5.0 lb/ton of solid waste fired for NO_x (as NO_2), and 0.8 lb/ton for CO. 790.6
These emission factors are equivalent to 796.9 lb/hr or 0.56 lb/10^6 Btu for NO_x (as NO_2) and 126.7 lb/hr or 0.089 lb/10^6 Btu for CO. 126.5

By comparison, NSPS for fossil-fuel-fired boilers [40 CFR 60, Subparts D and D(a)] limit NO_x (as NO_2) emissions to between 0.5 and 0.7 lb/10^6 Btu for solid fuel. No NO_x or CO emission-limiting standard currently exist or are proposed for incinerators or solid waste fired boilers.

Factors that influence NO_x emissions from solid waste boilers consist of boiler design, excess air, and peak combustion temperatures. NO_x emissions are derived from either the fuel-bound nitrogen being reduced and subsequently oxidized, or thermal oxidation of nitrogen in the combustion air. The latter source of NO_x is much greater than the former source. The primary factors affecting combustion air NO_x is the amount of oxygen in the combustion zone (i.e., related to excess air) and the peak combustion temperature.

CO is produced when carbon-containing fuel is burned in an oxygen-deficient atmosphere, resulting in the carbon atoms being oxidized partially to CO instead of totally to CO_2. An oxygen-deficient atmosphere may result from deficient amounts of combustion air or incomplete air/fuel mixing. High excess air, proper primary and secondary air distribution, and proper air/fuel mixing all tend to minimize unburned carbon and CO emissions.

3.4.2.4 Other Pollutants

Other pollutants emitted from the proposed source requiring BACT review are lead, fluorides, beryllium, mercury, sulfuric acid mist, and inorganic arsenic. These are all trace elements contained in solid waste in very minor quantities. The proposed BACT for lead, beryllium, and inorganic arsenic is the ESP for the control of PM emissions. These pollutants are emitted in the solid phase; therefore, control of PM emissions will also control these pollutants. The BACT emission limits are the emission rates presented in Table 3.4-4 for each pollutant.

Fluorides, sulfuric acid mist, and mercury are emitted in small quantities primarily in the gaseous phase and are not susceptible to collection by ESP. No additional control technology is proposed for these pollutants since such controls would be costly, unproven and would not provide significant environmental benefits.

3.4.2.5 Test Methods to Demonstrate Compliance

Compliance with NSPS for PM will be demonstrated by source emission tests conducted in accordance with the Federal Reference Methods specified in 40 CFR 60, Appendix A. Reference Method 1 will be used in sampling point determination for sample traverses. Reference Method 5 will be used in determination of PM emissions, grain loading, and moisture content.

3.4.3 Best Available Control Technology

Federal and state PSD/BACT regulations and guidelines require that an analysis of alternative control technologies to be conducted (USEPA, 1980; USEPA, 1978). The only alternatives that need be addressed are those "which have greater control capabilities than the system proposed as BACT and which have been used or proposed for the same or similar operations" (USEPA, 1978). If no better control technology than the proposed technology exists, no further analysis is necessary. Other equipment with similar control potential need not be evaluated.

The BACT analysis must support that the identified alternative control techniques would cause unreasonably adverse energy, environmental, or economic impacts. The following sections present the alternatives analysis required under BACT review and justify selection of the proposed control equipment described in Section 3.4.2.

3.4.3.1 Particulate Matter

In March 1979, USEPA conducted a survey of all existing and proposed incinerators in the United States (USEPA, 1979). The study identified three types of control devices as potentially applicable to incinerators: ESPs, fabric filters, and venturi scrubbers. Test results for PM were compiled for 14 municipal incinerators where the federal reference method (Method 5) was known to be used for testing. Solid waste charging rates varied from 30 to 600 TPD. Of these installations, only one used a fabric filter for PM control, while nine used ESPs and four utilized venturi scrubbers. Test results were as follows (corrected to 12-percent CO_2):

Fabric Filter:	0.024 gr/dscf
ESP:	0.018 to 0.060 gr/dscf, average of 0.041 gr/dscf
Venturi scrubber:	0.046 to 0.416 gr/dscf, average of 0.14 gr/dscf

These data indicate that fabric filter technology for incinerators is not well proven. Operational problems with filter bags were noted with the test results. However, the 0.024 gr/dscf emission rate was the second lowest of all test results; one ESP test was lower, with an emission rate of 0.018 gr/dscf.

ESPs are by far the most prevalent type of control and provide much better emission reduction that do venturi scrubbers. The venturi scrubber test results not only indicate much higher average emissions than the ESP, but scrubber deterioration due to wearing of scrubber parts has been noted on several installations. In addition, high scrubber pressure drops are required to meet the 0.08 gr/dscf NSPS, resulting in a significant energy penalty. Those venturi scrubbers meeting NSPS operated with pressure drops of 15 inches of water (in. H_2O) or greater, whereas an ESP typically operates at 1 to 2 in. H_2O.

Test data from eight additional municipal incinerator installations where the test method was not specified were also presented. Solid waste charging rates varied from 120 to 360 TPD, and ESPs were used at all of these installations. The PM emissions ranged from 0.013 to 0.108 gr/dcsf and averaged 0.059 gr/dscf (excluding two facilities where test results were reported in gr/acf).

In March 1982, EPA issued a background information document for non-fossil-fuel-fired industrial boilers (USEPA, 1982b). The study included a survey of solid waste boilers as well as refuse-derived fuel (RDF). This study stated:

> No successful scrubber applications to solid waste or RDF boilers exist: the fine particulate in these boiler exhausts can be removed only by very high-energy scrubbers which must be constructed of expensive corrosion resistant materials. The only solid waste boiler that used a wet scrubber replaced the scrubber with an electrostatic precipitator.
>
> Few full-scale baghouses have been applied to nonfossil fuel fired boilers... no baghouse installations exist on bagasee, solid waste or

RDF boilers. However, one baghouse operates successfully on an solid waste incinerator. The principal drawback to fabric filtration, as perceived by potential users, is a fire danger arising from the collection of a combustible carbonaceous fly ash.

Electrostatic precipitators are currently used on boilers fired with wood, solid waste or refuse derived fuel.

The data from the USEPA study show that ESP is highly proven for municipal incinerator applications and is capable of achieving PM emission levels well below NSPS and State of Florida emission standards. In addition, this technology has low energy requirements (i.e., pressure drop of 1 to 2 in. H_2O) and no liquid waste disposal problem. On the other hand, a high pressure drop is required across a venturi scrubber to achieve levels as slow as the proposed emission rate of 0.03 gr/dscf. This requirement would increase maintenance costs because of the severe wear on the venturi and increase energy costs significantly. The fabric filter is relatively unproven on municipal incinerators; although fabric filters potentially could achieve PM levels below 0.03 gr/dscf, they have experienced maintenance and operational problems which must be overcome before they are deemed reliable. For these reasons, venturi scrubbers and fabric filters were not considered further as viable control technologies.

Test data presented in the USEPA non-fossil-fuel boiler study consisted of ESP data only for solid waste fire boilers. PM emissions ranged from 0.2 to 0.05 lb/10^6 Btu at average specific collection areas (SCA) of 140 to 570 (ft^2/1,000 acfm, respectively. Data for the most efficient control device for PM emissions from solid waste boilers were also presented (obviously for an ESP, since no other test data were available). These data were for ESPs with SCAs of 240 ft^2/1,000 acfm or more, and emissions averaged less than 0.1 lb/10^6 Btu in each of the four cases presented. Emissions in lb/10^6 Btu were shown to decrease as the SCA increased, the lowest test case yielding about 0.05 lb/10^6 Btu with an SCA of 573

ft^2/1,000 acfm. The proposed facilities will achieve a PM emission level of approximately 0.074 lb/10^6 Btu.

The environmental impact of the selected control technology is considered to be minimal. The predicted maximum 24-hour average PM impact due solely to the proposed facility will be less than 10 percent of the de minimis air quality impact level (i.e., for monitoring exemption), less than 20 percent of the significant impact level (i.e., for modeling exemption), less than 3 percent of the PSD Class II increment, and less than 1 percent of Florida AAQS. Predicted annual average PM impacts due to the facility are 8 percent of the significant impact level (for modeling exemption), less than 1 percent of the PSD Class II increment, and less than 1 percent of Florida AAQS. These minimal environmental impacts do not justify a lower BACT emission level.

3.4.3.2 Sulfur Dioxide

Sulfur is contained in solid waste in very small quantities, typically about 0.12 percent on an as-fired basis. For the proposed facility, the resulting SO_2 emissions are 4.9 lb/ton or 0.55 lb/10^6 Btu heat input. Precombustion and postcombustion SO_2 control technologies have been developed for boilers firing fossil fuels. However, SO_2 control technologies have not been applied to boilers burning non-fossil fuels, such as solid waste, due to the low SO_2 emissions.

Precombustion control technologies consist of: (1) using naturally occurring low-sulfur fuels, and (2) physically or chemically cleaning the fuel. The solid waste fired in the proposed facility falls into this first category, with a sulfur content of 0.12 percent (i.e., 0.30 lb/10^6 Btu). By comparison, low-sulfur coal typically contains 0.5-percent sulfur (i.e., about 0.8 lb/10^6 Btu), and No. 2 distillate oil typically is as low as 0.35-percent sulfur by weight (i.e., about 0.4 lb/10^6 Btu).

No method of physically or chemically cleaning solid waste to lower its sulfur content is known to have been developed. The low sulfur content of solid waste has not required such a process to be developed. Therefore, precombustion sulfur removal from solid waste is deemed technologically unfeasible.

Postcombustion SO_2 removal techniques for boilers consist of the implementation of flue gas desulfurization (FGD) technology. Several different FGD systems have been developed, primarily for use on high-sulfur-fuel-fired boilers. These consist of sodium scrubbing, dual-alkali scrubbing, lime and limestone scrubbing, and dry scrubbing. These systems use calcium- or sodium-based scrubbing solutions which react with SO_2 to form sulfite and sulfate salts.

The major drawbacks to all of these systems are:

1. They produce large amounts of solid and/or liquid wastes, which must be disposed of properly. Disposal may cause other environmental effects (i.e., groundwater contamination).

2. Energy requirements to operate the FGD system are high. Typical FGD installations on electric utility boilers use 10 percent or more of the energy output of the boiler.

3. FGD systems have not been applied to incinerators where SO_2 concentrations are low and highly variable due to the variable nature of solid waste.

4. FGD systems are costly to install and operate and require considerable maintenance; due to operational problems, they are rarely available 100 percent of the time, unless costly redundancy is built into the plant.

5. FGD systems typically use large amounts of water for the scrubbing solution.

Costs of applying an FGD system to a resource recovery/incinerator facility were estimated by Environmental Research and Technology, Inc. (1981) as part of the PSD permit application for Westchester County (New York) Resource Recovery Facility. This facility is capable of firing 1,890 TPD of solid waste, which is approximately the size of the proposed Broward County facilities. Five different FGD system types were evaluated.

SO_2 removal efficiency to each system was assumed to be 70 percent. Capital costs of an FGD system were found to range from $7 to $9 million (1983 dollars). Annual costs, including fixed capital charges and operating and maintenance costs, ranged from $0.94 to $1.34 per 10^6 Btu for the first year of operation. These annual costs equate to $4.6 to $6.5 million, based on a 90-percent availability factor. (2.15) (3.04)

There are no energy penalties associated with the control technology proposed for the Broward County projects. The associated environmental impacts are minimal. The predicted maximum 24-hour SO_2 impacts due to the proposed facility are 45 percent of the de minimis impact level (i.e., for monitoring exemption) and 118 percent of the significant impact levels (i.e., for modeling exemption). Predicted impacts for all averaging times are less than 7 percent of all PSD Class II increments and Florida AAQS. The minimal SO_2 emissions and environmental impacts do not justify a lower BACT emission limit.

Considering the low SO_2 emissions from the proposed facility and the severe economic penalties, potential additional environmental impacts due to solid/liquid waste disposal, additional water and energy requirements, and unproven ability on solid waste fired boilers, implementation of an FGD system on the proposed BCRR facility is considered economically and environmentally unacceptable. None of the SO_2 removal alternatives is considered superior to that of firing low-sulfur solid waste fuel in the boiler.

3.4.3.3 Nitrogen Oxides and Carbon Monoxide

The proposed BACT control techniques for NO_x and CO emissions from the proposed facility are: (1) limit peak combustion temperature to 1,800°F, (2) proper solid waste firing in the boiler, and (3) high excess air operation. These control techniques are considered the only currently available methods of control for these pollutants.

The proposed BACT emission limits for NO_x result in maximum annual average predicted impacts of less than 5 percent of the de minimis impact level (i.e., for monitoring exemption), 60 percent of the significant impact level (i.e., for modeling exemption), and 0.6 percent of Florida AAQS. The proposed CO emission limit results in maximum predicted impact level, or Florida AAQS.

Further reduction in emissions could be achieved through add-on flue gas cleaning equipment, but such equipment or processes have not been demonstrated in practice on incinerators (USEPA, 1979). Flue gas cleaning methods for application to industrial/utility boilers with high NO_x emissions are currently in the developmental stage only. Therefore, add-on NO_x/CO controls are not considered technically feasible for this application. In addition, the very small air quality impacts due to NO_x and CO emissions from the proposed facility do not justify further reduction in emissions.

3.4.3.4 Other Pollutants

As discussed in Section 3.4.2.4, ESP's used to control PM emissions will also control emissions of lead, beryllium, and inorganic arsenic. Alternative PM control technology is discussed in Section 3.4.3.1. For the reasons stated therein, ESP's are considered to be the best choice of PM control technology for the proposed source and, therefore, BACT for control of lead, beryllium, and arsenic. The maximum predicted air quality impacts for these pollutants are well below all applicable air quality standards and de minimis impact levels. The minimal environmental impacts of these pollutants do not justify additional controls or reduced emission levels.

Additional control technology (i.e., add-on equipment) could be used to further reduce emissions of fluorides, sulfuric acid mist, and mercury, which are emitted primarily in the gaseous phase. For example, a wet scrubber could be used, which has been demonstrated to remove more than 99 percent of the fluorides at phosphate rock plants. However, due to the low emission rates for these pollutants and the economic and energy penalties associated with add-on control equipment, additional add-on equipment is not justified. The maximum predicted air quality impacts for these pollutants are well below all applicable air quality standards and de minimis impact levels.

Recently, concerns have been expressed about potential emissions of chlorinated dibenzodioxins and related compounds from solid waste resource recovery facilties. However, it is believed that such emissions, if present, will be at such low concentrations that no appreciable impact on the surrounding environment will result. Considering the temperature at which combusion of the solid waste will occur and other furnace characteristics, the potential for release of measurable quantities of these compounds would appears to be low. Appendices 10.16 and 10.17 of this application provide more detailed information on this issue. Given the low probability of occurrence of these compounds in the emissions in other than negligible amounts, the imposition of additional specific control devices on the proposed facility does not appear justifiable. As a result, none are herein proposed.

3.4.4 Design Data for Control Equipment

The following information is based on the design data provided by a specific vendor. Again, this information is provided on a preliminary basis and does not represent preference to any one vendor's design. Table 3.4.4.1 presents the efficiency and effectiveness of the electrostatic precipitator(s) proposed for the control of air emissions at the southern 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 conceptual simplified mass balance.

3.5 Plant Water Use

A quantitative preliminary water balance diagram for average and peak water use 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 water supply.

The plant water balance is designed to take advantage of operating procedures which will direct wastewater to the ash quench system and reduce neutralization chemical costs. The remaining plant process discharges will be disposed of at the Hollywood Wastewater Treatment Plant (HWWTP).

3.5.1 Heat Dissipation System

3.5.1.1 System Design

At the facility, the steam turbine condenser will be designed to meet maximum boiler American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE) output without any steam being extracted for process, for the

TABLE 3.4.4.1

ENVIRONMENTAL DATA

Air Pollution Control Equipment (Electrostatic Precipitator)

1. Particulate

a) The particulate size data from different facilities exhibit different characteristics. The size of the particulate matter entering and leaving the air pollution control equipment cannot be readily quantified due to changes in operation, design parameters, waste quality, and boiler configuration.

A review of data from incinerators equipped with ESP's indicate particle size distribution as follows:

	Uncontrolled	Controlled
Mass Mean Diameter	15 micron	10 micron
Percent less than 10 micron	42%	50%
Percent less than 2 micron	21%	24%

b) Inlet Loading: 10 grams/m^3 (sootblowing conditions).

c) Particulate density in terms of specific gravity: 38 lb/ft^3

d) Resistivity: Ranges 10^9 to 10^{10} ohm-centimeters.

2. Gas Flow

	Southern RRF (784 tons refuse/day per boiler)
a) Volume Flow Rate:	99.0 meters^3/second
b) Velocity:	0.85 meters/second
c) Temperature (per section):	288 °C.
d) Pressure	-0.2 psi
e) Viscosity:	0.026 cP

MALCOLM PIRNIE

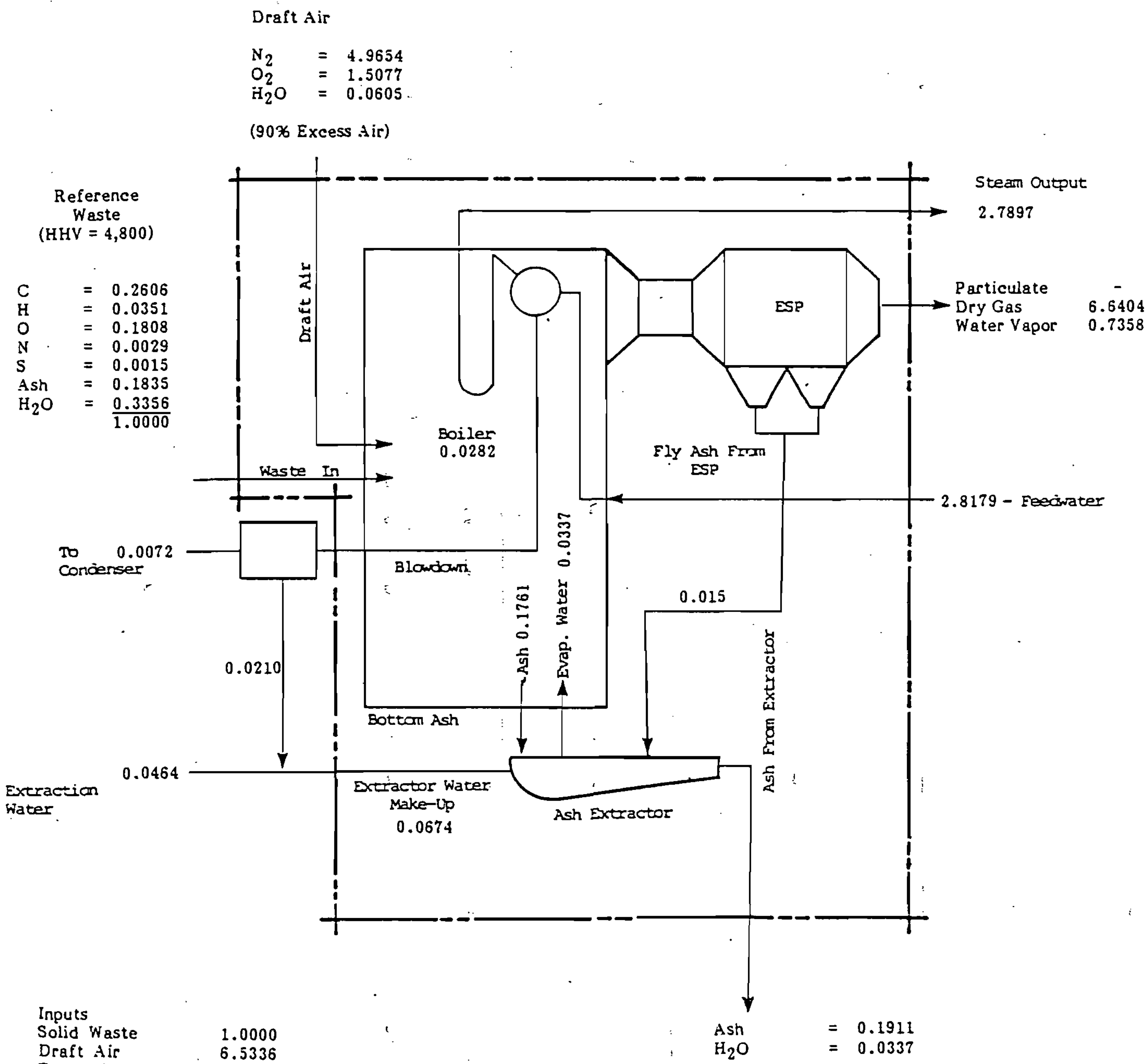
TABLE 3.4.4.1 (continued)

ENVIRONMENTAL DATA

		Southern RRF (784 tons refuse/day)
3.	ESP Design	
a)	Electrical Length per Plate	2.8 meters
b)	Wire to Plate Spacing:	150 millimeters
c)	Wire to Wire Spacing:	300 millimeters
d)	Wire Diameter:	2.5 millimeters
e)	Wires per Section	3,430 meters
f)	Wire Length per Section:	10.5 meters
g)	Plate Area per Section:	638 meter^2
h)	Number of Electrical Sections:	3
i)	Duct Width:	10.5 meters
4.	Electrical Design	
a)	Applied Voltage each Section:	55,000 volts
b)	Total Current in Electrical Section:	1,000 mA
c)	Roughness of Wire	- roughness factor

MALCOLM PIRNIE

FIGURE 3.4.5.1



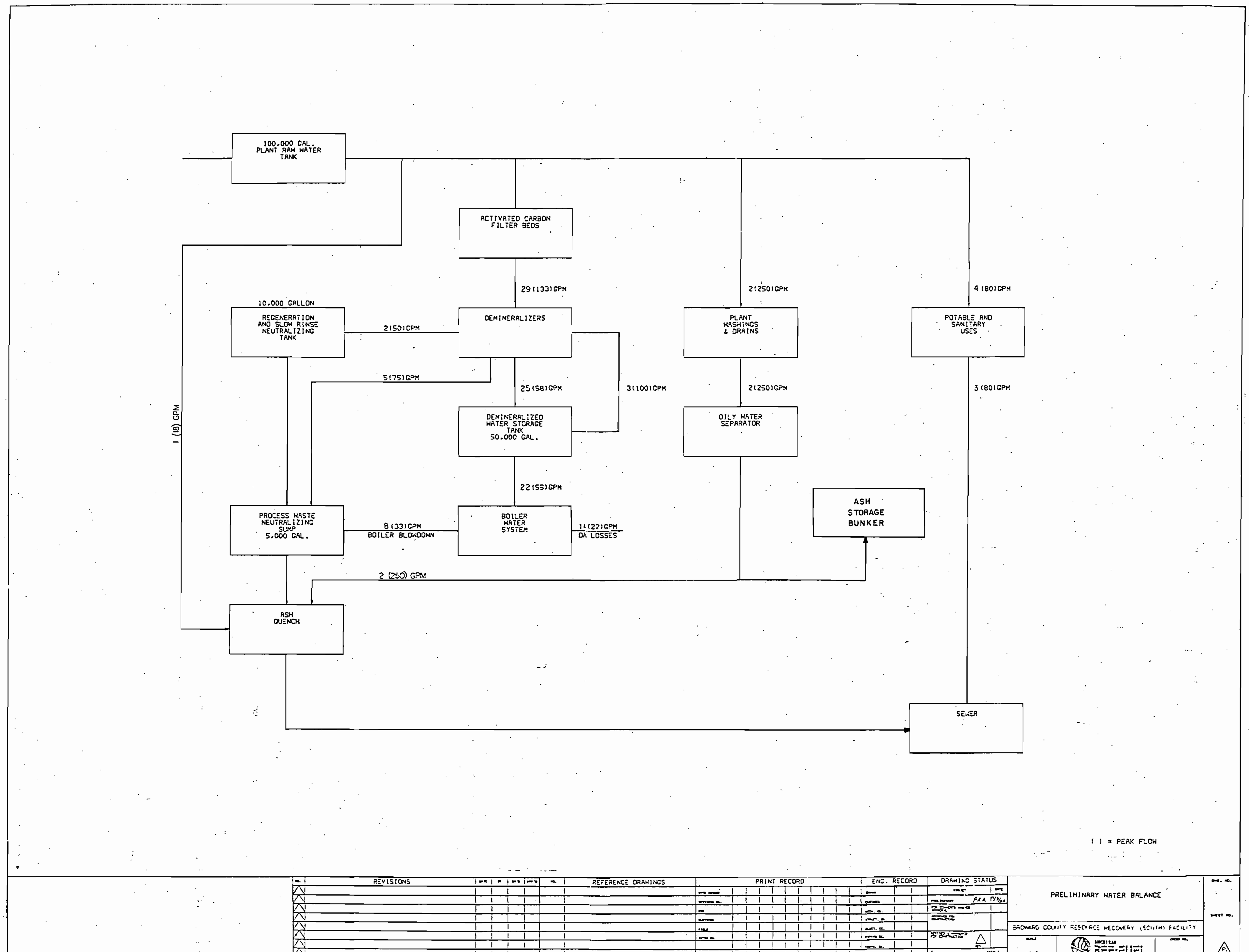
Inputs	
Solid Waste	1.0000
Draft Air	6.5336
Extraction Water	0.0674
Feedwater	2.8179
Total In	10.4189

Outputs	
Steam	2.7897
Blowdown	0.0282
Dry Flue Gas	6.6404
Water Vapor	0.7358
Ash	0.1911
Water	0.0337
Total Out	10.4189

CONCEPTUAL DESIGN

SIMPLIFIED MASS BALANCE

FIGURE 3.5.1



100,000 GAL. PLANT RAW WATER TANK
ACTIVATED CARBON FILTER BEDS
29 (133) GPM
2 (250) GPM
4 (80) GPM
10,000 GALLON
REGENERATION AND SLOW RINSE NEUTRALIZING TANK
2 (50) GPM
DEMINERALIZERS
PLANT WASHINGS & DRAINS
POTABLE AND SANITARY USES
5 (75) GPM
25 (58) GPM
3 (100) GPM
2 (250) GPM
3 (80) GPM
1 (18) GPM
DEMINERALIZED WATER STORAGE TANK 50,000 GAL.
OILY WATER SEPARATOR
22 (55) GPM
ASH STORAGE BUNKER
PROCESS WASTE NEUTRALIZING SUMP 5,000 GAL.
8 (33) GPM
BOILER BLOWDOWN
BOILER WATER SYSTEM
1 (22) GPM
DA LOSSES
2 (250) GPM
ASH QUENCH
SEWER
( ) = PEAK FLOW
REVISIONS
REFERENCE DRAWINGS
PRINT RECORD
ENG. RECORD
DRAWING STATUS
PRELIMINARY WATER BALANCE
BROWARD COUNTY RESOURCE RECOVERY (SOUTH) FACILITY
NONE
AMERICAN REF-FUEL
C27971

hottest day in the year, as per the Weather Bureau, for the Broward County area.

The vendor will provide cooling systems sized to condense the exhaust steam for the turbine assuming all boilers are in operation. Reducers and coolers of steam pressure will be installed so that the facility can also bypass the turbine and condense the total output of all boilers under maximum steam generation. Sustained venting of steam will be avoided. The condensing system shall be valved and piped to increase operation and maintenance flexibility.

The cooling system proposed to be utilized at the facility is an air cooled condenser. It will be designed for an exhaust steam pressure of between 3 and 4 inches of mercury absolute. The air cooled system will require approximately 50 gallons per minute of makeup water average. The location of the air cooled condenser is shown on Figure 2.1.2, Civil Site Plan. The condenser will be approximately 40 feet in height.

3.5.1.2 Source of Cooling Water

Water requirements for cooling water can be provided by County. County has an existing 12-inch diameter water main, which runs east-west along Griffin Road south of the project site. An 8-inch line extends north from that main to a point adjacent to the resource recovery facility site. Water quality data for the County water plant that would provide service to the southern site is provided in Table 3.5.1.1. Preliminary information from the County indicates that approximately 100 gpm of water from the County water system may be available to this site.

3.5.1.3 Dilution System

Since all cooling water intake will be from the County Utility, no dilution of intake water will occur. Discharge water, limited to boiler blowdown, will be disposed of directly to a sanitary sewer with no dilution required (see

TABLE 3.5.1.1

1982 AVERAGE ANNUAL WATER QUALITY VALUES FOR
THE BROWARD COUNTY SYSTEM 3-A PLANT

Analytical Results	Raw Water	Finished Water
Water pH at the Plant	7.25 units	8.75 units
Water pH at the Field	-	8.50 units
Water Color at the Plant	63 CU	12.0 CU
Water Color at the Field	-	12.8 CU
Water Odor No. Dilutions	3 DIL	-
Water Turbidity	-	0.41 BTU
Water Free Carbon Dioxide	21 mg/l	0 mg/l
Calcium Hardness as $CaCO_3$	209 mg/l	63 mg/l
Magnesium Hardness as $CaCO_3$	18 mg/ l	14 mg/l
Total Hardness as $CaCO_3$	227 mg/l	77 mg/l
Total Mo. Alk. as $Ca\ CO_3$	198 mg/l	26 mg/l
Non Carbonate Hardness as $CaCO_3$	29 mg/l	51 mg/l
Calcium as Ca^{+2}	4.4 mg/l	3.4 mg/l
Iron as Fe^{+2}	1.67 mg/l	0.03 mg/l
Sodium as Na^{+1}	23.2 mg/l	23.8 mg/l
Bicarbonate as HCO_3^{-1}	242 mg/l	31.7 mg/l
Chloride as Cl^{-1}	35 mg/l	52.4 mg/l
Sulfate as SO_3^{+2}	17.0 mg/l	18.0 mg/l
Fluoride as F^{-1}	0.19 mg/l	0.88 mg/l
Total Dissolved Solids	408 mg/l	173 mg/l
Total Res. Chlorine	-	2.9 mg/l
Total Free Chlorine	-	2.5 mg/l
Total Comb Chlorine	-	0.4 mg/l
Saturation Index	+0.00	+0.14 mg/l

Figure 3.5.1). All wastewater discharges will meet the City of Hollywood pretreatment criteria as well as BCEQCB and Broward County Utilities Division standards.

3.5.1.4 Blowdown, Screened Organisms, and Trash Disposal

Because facility process water will be provided by a direct hookup with a water utility force main, screened organisms and trash associated with intake screens do not present a problem.

Boiler and cooling tower blowdown will be sent to a process neutralization sump. The pH of the blowdown may be near 10.5 to 11.5. However, its low volume and low buffering capability will bring the pH to within the typical 6 to 9 pH discharge limits when mixed with other discharge wastes. Mixing with other discharges will also reduce the temperature to approximately 90°F. Excess water that cannot be utilized for ash quench will be disposed of at the HWWTP (see Figure 3.5.1).

3.5.1.5 Injection Wells

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

3.5.2 Domestic/Sanitary Wastewater

The sanitary sewers from the Truck Scale Building, the Administration Building and the Refuse Building will be collected and will flow to an existing sanitary sewer, with no pretreatment. Flow rates will be approximately 3,000 gallons per day.

3.5.3 Potable Water Systems

All facility water requirements will be supplied by the Broward County Utilities Division. As described in Subsection 3.5.1.2, Source of Cooling Water, no treatment is anticipated for non-process water applications (i.e., sanitary uses). Intake volume for non-process water is approximately 3,000 gallons per day.

3.5.4 Process Water Systems

As described above, all facility intake water will be provided from the County's potable water supply. Peak process water intake quantities will be approximately 100 gallons per minute. This includes water required for boiler and air cooled condenser makeup (blowdown and evaporative losses). Treatment of intake water will be limited to the following:

- o Boiler Water Treatment

- Iron dispersant	14,100	lbs/year*
- Phosphate	1,100	lbs/year
- Hydrazine	1,800	lbs/year
- Neutralizing/ Filming Amines	1,800	lbs/year

- o Deminieralizer

- H_2SO_4 (93% H_2SO_4)	48,600	lbs/year
- NaOH (50% NaOH)	85,500	lbs/year

*Approximate quantities.

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

A second source of process wastewater is leachate generated in the residue/unporcessable waste landfill. To assess the potential volume of leachate generated at the landfill, various stages of landfill development were analyzed. The results of this water balance analysis indicate that during the May-October "wet" season, leachate production ranges from 0.5 to 8.3 million gallons per month, depending on the operation phase. All leachate will be disposed of at the HWWTP. For a more complete discussion on leachate production, see Section 5.3.4, Leachate and Runoff.

3.6 Chemical and Biocide Waste

The resource recovery facility intake water is provided from the County potable water supply by the Broward County Utilities Division. The system water losses (deaerator stripping steam, boiler and condenser blowdown, miscellaneous system losses) will be made up with demineralized water. A strong acid/ strong base demineralizer system will provide the quality of feedwater necessary for the boilers. The make-up water is fully treated and pumped to a storage tank. This tank then supplies the make-up water necessary to the boilers.

The ion exchange system will be preceded by carbon bed absorption filters so as to effectively reduce organic contaminants and chlorine residual which would otherwise attack the ion exchange resins. The ion exchange system is a dual train system with separate anion and cation beds. The sulfuric acid and sodium hydroxide regenerant feeds will be adjusted to meet the bed ion exchange capacity requirements and to self neutralize when the regenerant feed and slow rinse cycles are combined in the waste neutralization tank. The neutralized process wastewater along with boiler blowdown water will then be pumped to the ash quench trough where it is evaporated or carried with the ash. Excess wastewater is discharged to the local sanitary sewer (as illustrated on Figure 3.5.1). Landfill leachate as collected will be pumped to a local sanitary sewer force main for ultimate disposal. No on-site treatment of leachate will occur.

The exact flow diagram of the chemical waste system will be developed by a yet to be selected vendor. There are no discharges from chemical processing, water treatment or leachate that may enter the local environment as the result of plant operations.

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 double lined landfill located on the same site as the resource recovery plant. Details describing the design of the landfill are contained in Section 5. Possibilities for chemical fixation, the design parameters for leachate and stormwater runoff control are also contained in Section 5.

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 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 25 cubic yards per hour with three boilers operating at their initial installed capacity. The three points at which ash residue waste is generated and collected are as follows:

- Bottom-Ash - Burnout is achieved as waste is tumbled along the rollers or grates which comprise the stoker system. The residue passes over the final roller or grate 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

Bottom ash, siftings, and collected fly ash will be quenched. Dual hydraulic, ram-type, ash extractors will push the ash up an inclined chute to a discharge opening.

From this opening the ash will enter a bifurcated chute that will direct the ash to either of two 100 percent capacity conveyors. These will be vibrating conveyors which will smooth out the slugs of ash that are removed from the quench tank by the ash extractor, permitting a level burden to be conveyed to the residue bunker.

All of the ash-handling equipment will be enclosed in a separate ash gallery to facilitate maintenance and control of vagrant dust, vapors, and noise emissions.

The conveyor will discharge the ash into the residue storage bunker. The residue storage area will provide enough storage capacity for all residue generated at the design rate, for a minimum of three days at full operating capacity.

An overhead crane with a clamshell bucket or front end loader may be used to transfer the residue from the bunker to residue trucks.

Following are the anticipated technical specifications for components of the ash handling system (full technical specification of the proposed system appear in Appendix 10.11):

- Quenching Tank/Basin/Trough

Number per Furnace/Boiler	2
Dimensions (LxW) ft.	6 ft-6 in. x 2 ft - 3 in.
Capacity (cu.ft.)	19.74

- Conveyors

Bottom Ash: Type	Vibratory
Capacity (tons/hr)	7.0
Fly Ash: Type	Screw
Capacity (tons/hr)	2.0

- Ash Bunker (Enclosed)

Dimensions (LxWxH) ft.	224 x 24 x 25
Capacity (tons)	4,000

- Overhead Cranes for Ash Handling

Number	1
Capacity (tons)	5

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:

- Putrescible content: <0.3% by dry weight.

- o Moisture content (excluding free liquid): 30% by weight.
- o Bulk density (lbs/cu.ft.) 1,000-2,000
- 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. The ash residue will be tested periodically to insure conformance with the Federal Resource Conservation and Recovery Act standards. Appendix 10.12, Summary Update of Research Projects with Incinerator Bottom Ash Residue illustrates the non-hazardous nature of ash residue as well as its suitability for landfilling.

3.8 On-Site Drainage System

3.8.1 General

The project site is located east and downstream of the South Florida Water Management District C-11 Canal drainage basin.

On-site drainage for the project will be provided by separate systems for the resource recovery facility and the landfill. A discussion of the conceptual plan for each system follows. The design calculations which were used to base the conceptual design are provided in Appendix 10.13.

3.8.2 Water Quality Design Criteria

South Florida Water Management District (SFWMD) water quality guidelines for dry retention areas require a dry retention volume equal to 50 percent of the runoff from the 3-year, 1-hour storm (precipitation = 2.8 inches). This required retention storage will be provided typically in dry retention swales, dry retention ponds and/or underground exfiltration systems. Excess runoff, beyond that which is retained immediately on site will be conveyed, typically via culverts, to detention ponds which are sized to supply sufficient storage volume to meet the quality criteria. Water stored by detention in the ponds will be released by controlled gravity discharge to the wetlands area and C-11 canal in accordance with SFWMD discharge criteria. Recovery to elevation 2.0 feet NGVD will be by filter berms.

3.8.3 Peak Discharge Criteria

The project is located downstream from SFWMD Pump Station S-13 and outside (i.e., downstream) of the C-11 drainage basin. To meet SFWMD design discharge criteria, post development peak discharges from the site will be limited to predevelopment levels for the 25-year 72 hour design storm.

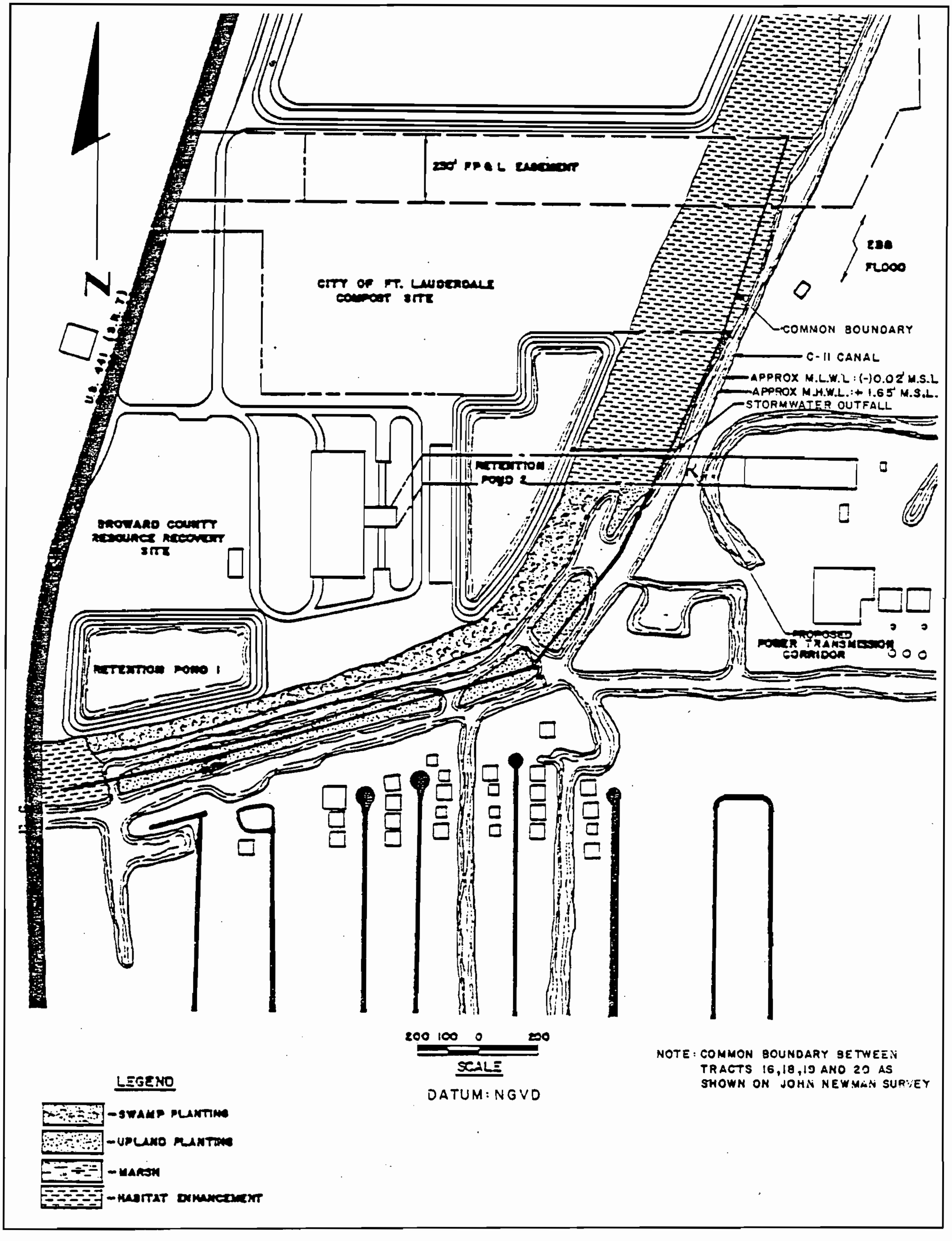
3.8.4 Seasonal Water Table Elevations/Control Elevation

Water levels in the C-11 canal adjacent to the property, and downstream of SFWMD Pump Station S-13, are basically tidal in origin and typically range on an annual basis between -1.64 ft., National Geodetic Vertical Datum (NGVD) (flood tide) and elevation -0.02 ft., NGVD (ebb tide). Stages within the canal are at times affected by gate operation and pumping at S-13, and are regulated to provide flood control in upstream reaches as well as to maintain adequate groundwater levels to discourage saltwater migration. Groundwater levels in the area fluctuate during the various seasons in conjunction with precipitation patterns and the operation of Pump Station S-13.

A control elevation of 2.0 ft., NGVD has been assumed for the project in accordance with existing conditions and with the recommendations of the Broward County Water Management Division.

3.8.5 Resource Recovery Facility

The required stormwater retention will typically be provided by on-site dry retention swales and/or dry retention



BROWARD COUNTY

SITE PLAN
SOUTHERN RESOURCE RECOVERY FACILITY

ponds. Disposal of retained water in these areas will be accomplished via percolation and evaporation processes. Excess runoff, beyond that which is retained in the retention areas will be conveyed to two ponds (pond 1 and pond 2). These ponds, which are approximately 3.4 and 4.3 acres in area, will be constructed at the southern and eastern portions of the RRF site (Figure 3.8.5.1). Detained water in the ponds will be released by controlled gravity discharge, via a weir/culvert structure to the C-11 canal in accordance with SFWMD discharge criteria. The ponds will be hydraulically connected.

The major outfall structure for the site is located at Pond 2. It consists of a weir overflow structure (invert el. 2.3 ft. NGVD with a pipe, sluice gate and a baffle for water quality and discharge control. An approximately 36-inch in diameter Reinforced Concrete Piping (RCP) connects the structure to the C-11 canal, which is the final discharge point for project drainage. Specifically, post development peak discharges from the resource recovery facility site, for the 25 year-72 hour design storm, will not exceed predevelopment levels. Peak discharge to the C-11 canal will be approximately 23 cubic feet per second (cfs) which is the estimated predevelopment discharge. Discharge velocities will be limited to below 4 feet per second, for erosion control purposes. The weir outfall control structure will be furnished with a baffle for oil, grease and sediment control. The invert of the weir will be set at elevation 2.3 feet NGVD. This elevation provides sufficient retention for water quality control. Elevation 2.0 feet NGVD is the established control elevation for the site. Water level in the ponds will rise to elevation 4.8 ft NGVD during the 25 year-72 hour storm. Ponds will be constructed with a minimum 0.5 foot freeboard.

Berms will be constructed to contain water during dredging and 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.

3.8.6 Residue/Unprocessable Waste Landfill

The surface water management system for the landfill portion of the project will be designed to accommodate current and future site utilization. A phased development and operational plan is envisioned in order to address such issues as the routing and treatment of runoff from active portions of a landfill cell and concerns regarding the quality and appropriate control methods for the disposal of surface runoff during rainfall periods.

3.8.6.1 Preclosure Operation

Preclosure operations will be conducted to provide the required protection for water resources. The major preclosure operations are described below:

- o Before material is deposited within a given landfill cell:
  - The landfill cell will be surrounded by a perimeter access road which will serve as a dike to prevent on-site runoff from impacting off-site areas and will also protect the fill from stormsurge flooding.
  - The landfill cell will be surrounded by a grassed perimeter swale system.
  - The landfill cell will have an impermeable bottom liner and underdrain system to capture any leachate generated within the landfill.
- o Typically active areas within the landfill cell will be temporarily bermed in order that stormwater runoff that does not come in contact with landfill materials (thus being uncontaminated) will be directed to a gravity outfall to the retention pond (Figure 3.8.6.1). Storwmater runoff that comes in contact with landfill waste materials will be treated as leachate and collected in the landfill cell underdrain system and conveyed along with the

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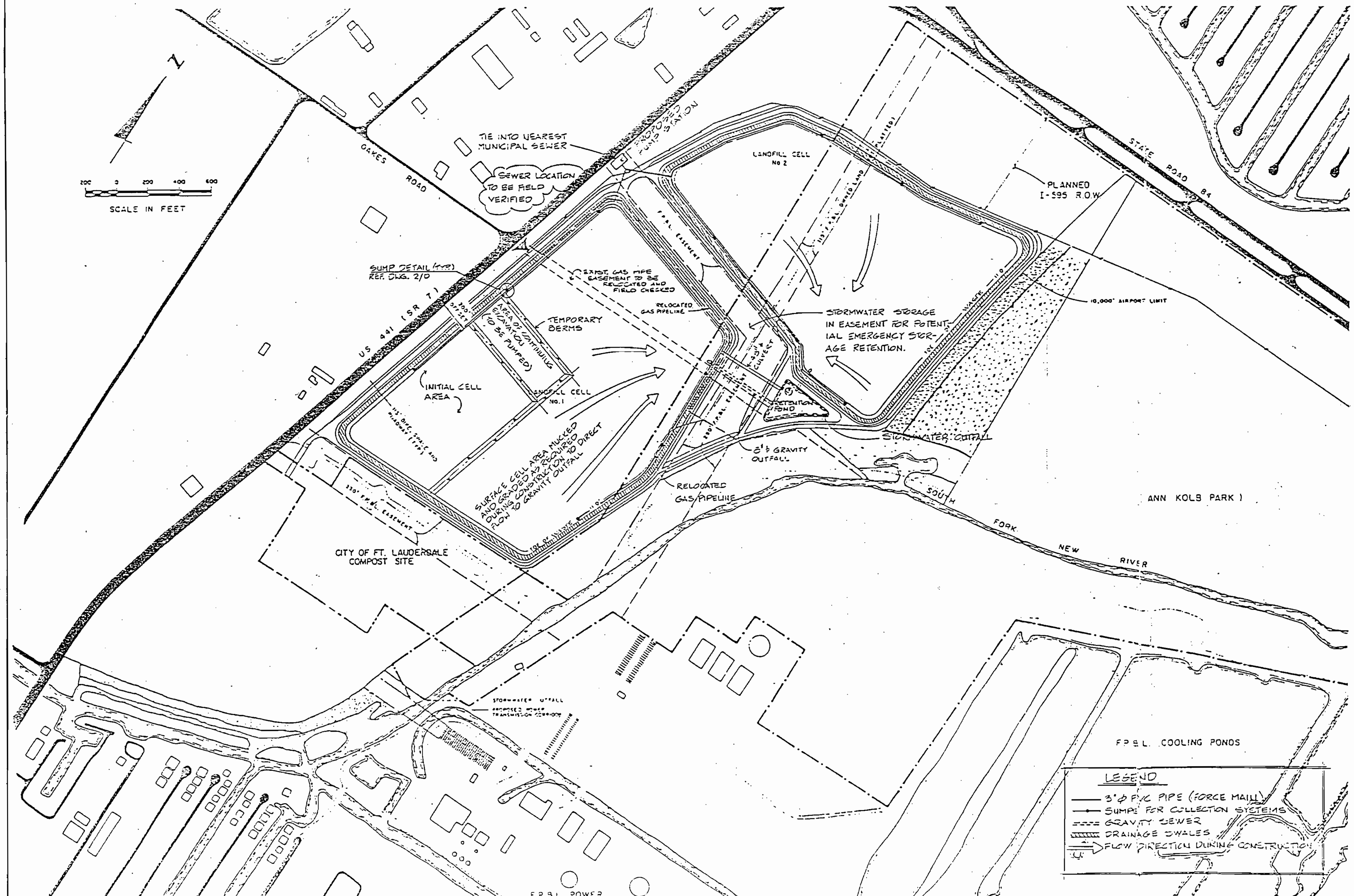
FIGURE 3.3.6.1



CONCEPTUAL DESIGN

BROWNING-FERRIS INDUSTRIES
ENGINEERING SERVICES
14701 SAINT MARY'S STREET • P.O. BOX 3151 • HOUSTON, TEXAS 77001 • (713) 870-8100

SITE DRAINAGE CONTROL
PROPOSED LANDFILL DESIGN
SOUTHERN RESOURCE RECOVERY FACILITY
BROWARD COUNTY, FLORIDA

SCALE 1" = 400'
DRAWN BY G. IVOY
DESIGNED BY J. MAGNESS

C

landfill leachates to a common collection sump for ultimate disposal at the Hollywood Waste Water Treatment Plant. This collection and disposal system will be separate from the stormwater management facilities. A more detailed description of landfill operations is provided in Section 5.3.

- The Route 441 landfill site will ultimately consist of two landfill cells. Each cell will be surrounded by a perimeter access road which will serve as a dike in order to insure all surface runoff is contained on site and to protect the fill from flooding.

  A grassed perimeter swale will be located between the toe of each landfill cell and the cell's perimeter access road. During periods of rainfall, uncontaminated stormwater will run off covered portions of the landfill and be captured in the perimeter swale system. Runoff from the landfill which is captured in the perimeter swale systems will typically drain via culverts beneath the access road ultimately to a stormwater pond from where final disposal can take place. The ultimate method of stormwater runoff disposal will vary as the landfill site is developed, as indicated in Sections 4 and 5 below.

- The development plan for the landfill site will initially involve ash and non-processable waste disposal in landfill cell 1, which is expected to occur over a period of 14 years, (i.e. 1988 to 2002). During this entire 14 year period, the area set aside for landfill cell 2 will be utilized as a temporary retention area for runoff from landfill cell 1. This will be accomplished by connecting the perimeter swale around landfill cell 1 to the cell 2 retention area by culverts passing under the perimeter road. Thus, during rainfall periods stormwater run-off from capped and interior portions of the landfill cell will first be captured in its perimeter swale system and then flow by gravity through the culverts to the retention area. The retention area will be connected by pipes to a pond near the southeast corner of landfill cell 2 and to the diked FPL easement for potential emergency storage retention. The easement will be connected hydraulically via an equalizer structure to the retention pond. Runoff will typically flow from the perimeter swale to the retention area to the stormwater pond where final disposal will be to the C-11 canal (see Figure 3.8.6.1 for details). Water levels will rise to elevation 5.9 feet NGVD during the 25 year-72 hour storm. Recovery to control elevation 2.0 NGVD will be by filter berm bleeddown an controlled gravity discharge to the wetland areas bordering the C-11 canal.

o Peak discharges to the C-11 canal will be limited to predevelopment or natural levels for the 25 year-72 hour design storm, in accordance with SFWMD discharge criteria. The analysis provided in Appendix 10.13 has determined that for the design storm, peak discharges from the stormwater pond to the C-11 canal will be limited to approximately 104 cubic feet per second (cfs). By approximately the year 2002, landfill cell 1 will be completely filled and inactive and will have been closed in accordance with federal, state and local regulatory agency requirements. This includes final capping with two feet of earth and seeding to create an established vegetative cover. At this time, (year 2002) the remaining landfill cell 2, will become the site for active landfilling.

During the continued development of the landfill site, a major objective of the stormwater management system will be to utilize remaining available land for stormwater retention purposes. Thus, during the landfilling of cell 2, unused portions of the cell 2 site will be set aside for uncontaminated stormwater retention purposes. Runoff from landfill cell 2 and the developed portions of landfill cell 2 will be directed via culverts to these areas. Culverts will connect these areas to the stormwater pond for ultimate disposal. As available on-site stormwater storage is depleted due to the continued filling of cell 2.

Peak discharges to the C-11 canal will be limited to predevelopment or natural levels for the 25 year - 72 hour design storm, in accordance with SFWMD discharge criteria. The analysis provided in Appendix 10.13_ has determined that for the design storm, peak discharges from the stormwater pond to the C-11 canal will be limited to approximately 104 cubic feet per second (cfs).

3.8.6.2 Post Closure Operation

Final closure of landfill cell includes several operations to ensure long-term protection of surrounding waters:

- o At final closure each landfill cell (i.e. 1 and 2) will have been closed in accordance with federal, state and local regulatory agency requirements. This includes capping with two feet of earth and seeding.
- o SFWMD water quality and quantity criteria will be satisfied by the retention of an initial portion of the landfill runoff within the FP&L easement area and stormwater pond with ultimate disposal via controlled gravity discharge to the C-11 canal.

Runoff will be directed from the cell 1 and 2 perimeter swales to the retention areas in the pond and FP&L easement. Water quality criteria will be met by retaining 50 percent of the 3 year-1 hour storm. This will require approximately 14.2 acre-feet of storage above elevation 2.0 feet NGVD. A discharge weir elevation set at 3.7 feet NGVD provides this desired retention. Recovery to elevation 2.0 feet NGVD will be accomplished with filter berms.

Peak discharges during the 25 year-72 hour storm will be attenuated so as not to exceed 104 cfs; the estimated predevelopment set discharge. Water levels in the retention pond and easement will rise to elevation 8.6 feet NGVD during the 25 year storm. Peak flows from larger storm events will be discharged through an emergency outflow control structure. This structure will have sufficient capacity to hold retention pond water levels at elevation 10.0 feet NGVD for peak discharges from the 100 year-72 hour storm event.

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. All equipment will be positioned inside the facility's buildings, and all maintenance will be carried out within the building except for routine painting, electrical work, and minor maintenance. The room where the steam turbogenerator is housed will have an overhead crane for maintenance of the turbogenerator. The solid waste and residue will be hauled in trucks. Section 5.9 describes and analyzes the impact of the truck traffic.

3.9.2 Landfill

A list of the heavy equipment that would be used in the normal operation of the landfill and ash handling is presented in Table 3.9.2.1. This equipment will be transported to the site over existing roads. On the site both permanent and temporary roads will be constructed so vehicles can carry refuse from the main service road to the working face of the landfill road construction and will be on a continuous basis as filling progresses to ensure efficient waste flow to the active landfill cell. Temporary roads will be constructed with on-site fill material wherever possible, well drained and constructed so that grades will not exceed 6 percent. All roads will be continually maintained to control dust and to allow free traffic flow at all times.

An equipment maintenance building will be constructed near the entrance of the landfill where equipment will be stored when not in use and for routine maintenance. Appropriate pollution control measures will be taken at the maintenance building.

TABLE 3.9.2.1

EQUIPMENT LIST

Landfill	Ash Handling
2 Caterpillar D8L Dozers	1 Caterpillar 980 F.E.L.
1 Caterpillar D5 Dozer	1 Caterpillar 966 F.E.L.
1 Gradall	3 Dump Trucks
1 Road Grader	1 Street Sweeper
1 Tractor	
1 Grease Truck	
1 4 x 4 vehicle	
1 Water Truck	

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 Southern Broward County Resource Recovery Facility will be approximately 36 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 24 month construction phase. After construction, there will be approximately five months of personnel training, equipment testing, plant start-up shakedown. The exact schedule will be determined by the selected vendor.

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.

The principal construction phase for landfill development will be divided into three phases. Phase I will include site preparation (site survey, drainage swales, stormwater area, pump station and maintenance yard), installation of monitor wells, facilities construction (office, maintenance building, entrance, fencing and landscaping) and preparation of the initial disposal area (construction of three sump pumps, a contingency collection system and a leachate collection system). Phase II will be the construction of the remainder of Cell 1. Phase II will follow the same construction procedure as that of Phase I to prepare the cell area. Phase III is the construction of Cell 2. The overall construction sequence is the same as that of Cell 1.

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.

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 200 acres. Fifty acres for the resource recovery facility and 150 acres for the landfill cells. 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 as indicated on Figures 4.1.1 & 4.1.2 and will be stockpiled in designated areas of the site. Borrow will be obtained from off-site as necessary.

2. On-Site Excavation and Filling

   Excavation will be required for the two landfill cells, three retention ponds, 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 facility and landfill sites will be

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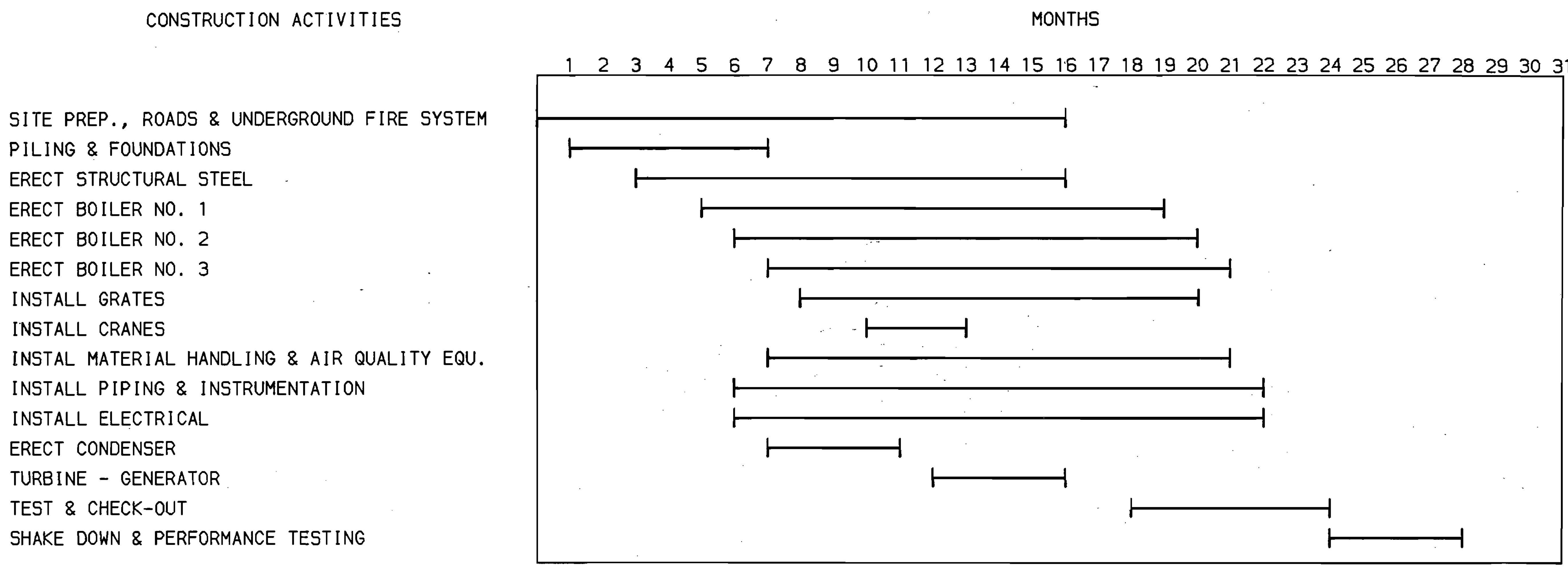
FIGURE 4.1



BROWARD COUNTY

RESOURCE RECOVERY PROJECT
ESTIMATED FIELD/CONSTRUCTION SCHEDULE

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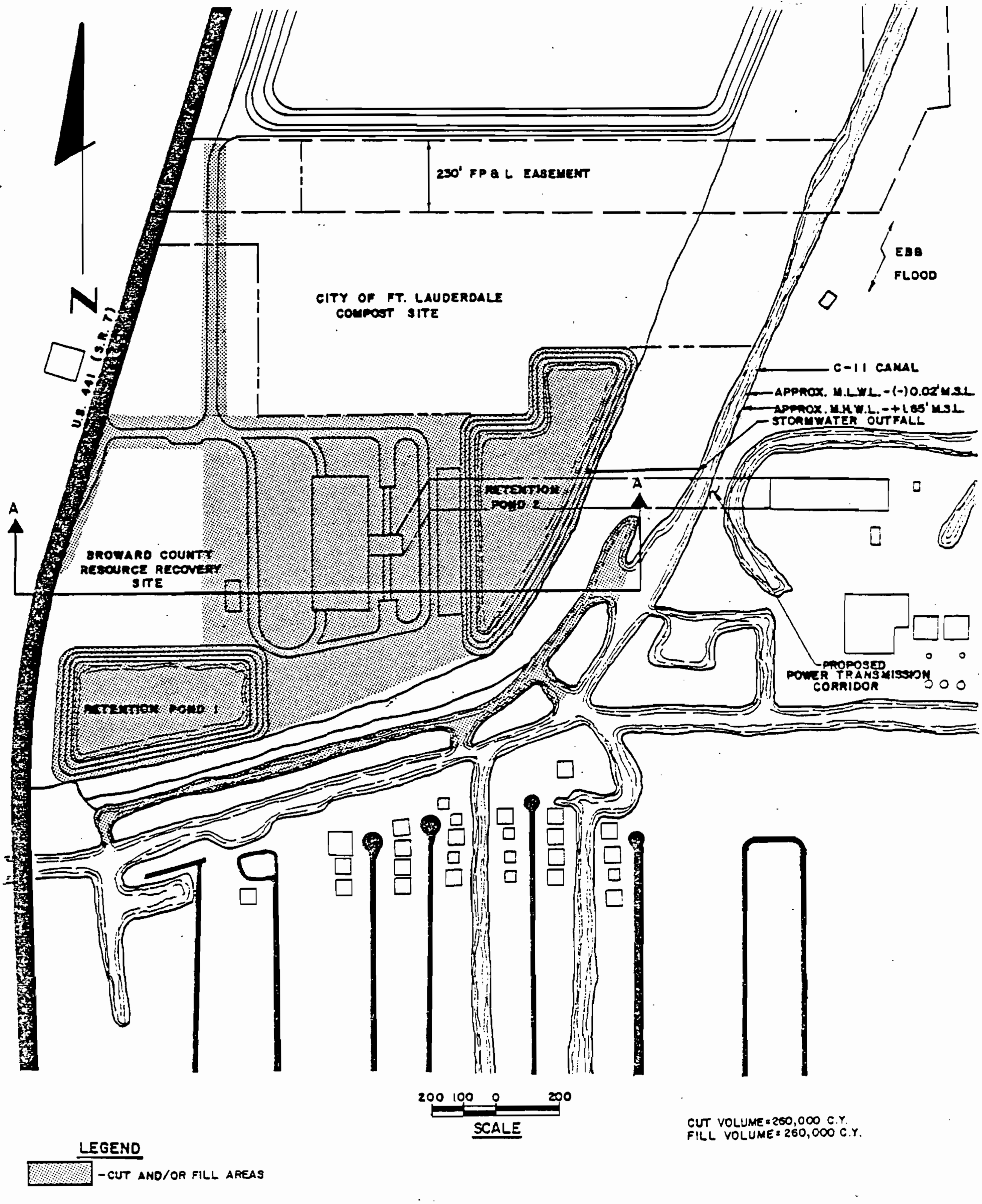
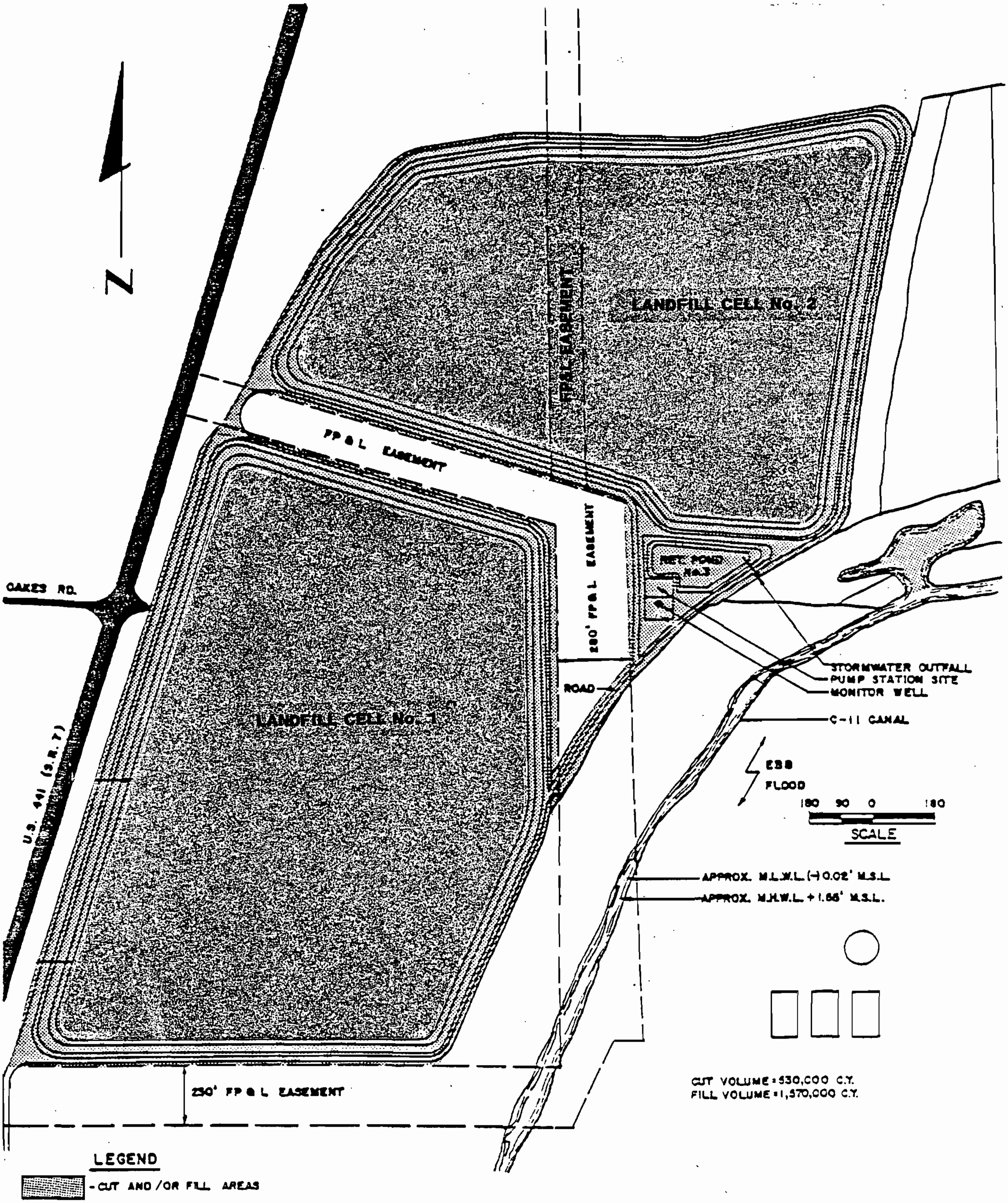


BROWARD COUNTY

CUT AND FILL AREAS
SOUTHERN RESOURCE RECOVERY FACILITY

SECTION A-A REFER TO FIGURE 3.2.1.1



BROWARD COUNTY

CUT AND FILL AREAS
SOUTHERN RESIDUE/UNPROCESSIBLE
WASTE LANDFILL

filled to a minimum of +7.0 feet MSL during development. 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.

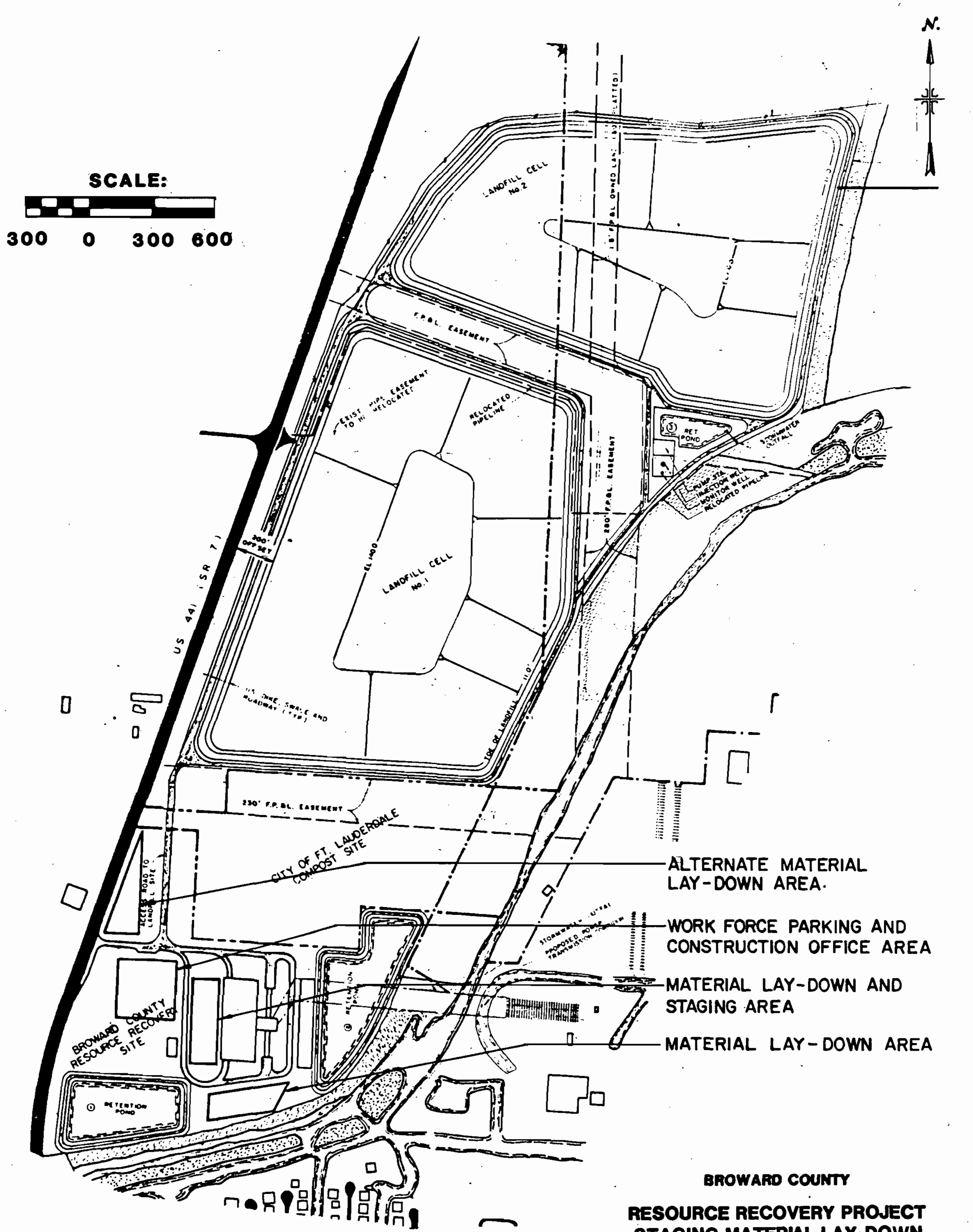
4.1.1.2 Staging, Material, Lay-Down, and Work Force Parking Areas

The staging, materials lay-down, storage, and parking areas must be directed to areas where there are minimal construction activities. Areas west and south 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 4.1.3 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

FIGURE 4.1.3



BROWARD COUNTY

RESOURCE RECOVERY PROJECT
STAGING MATERIAL LAY DOWN
AND WORK FORCE AREAS

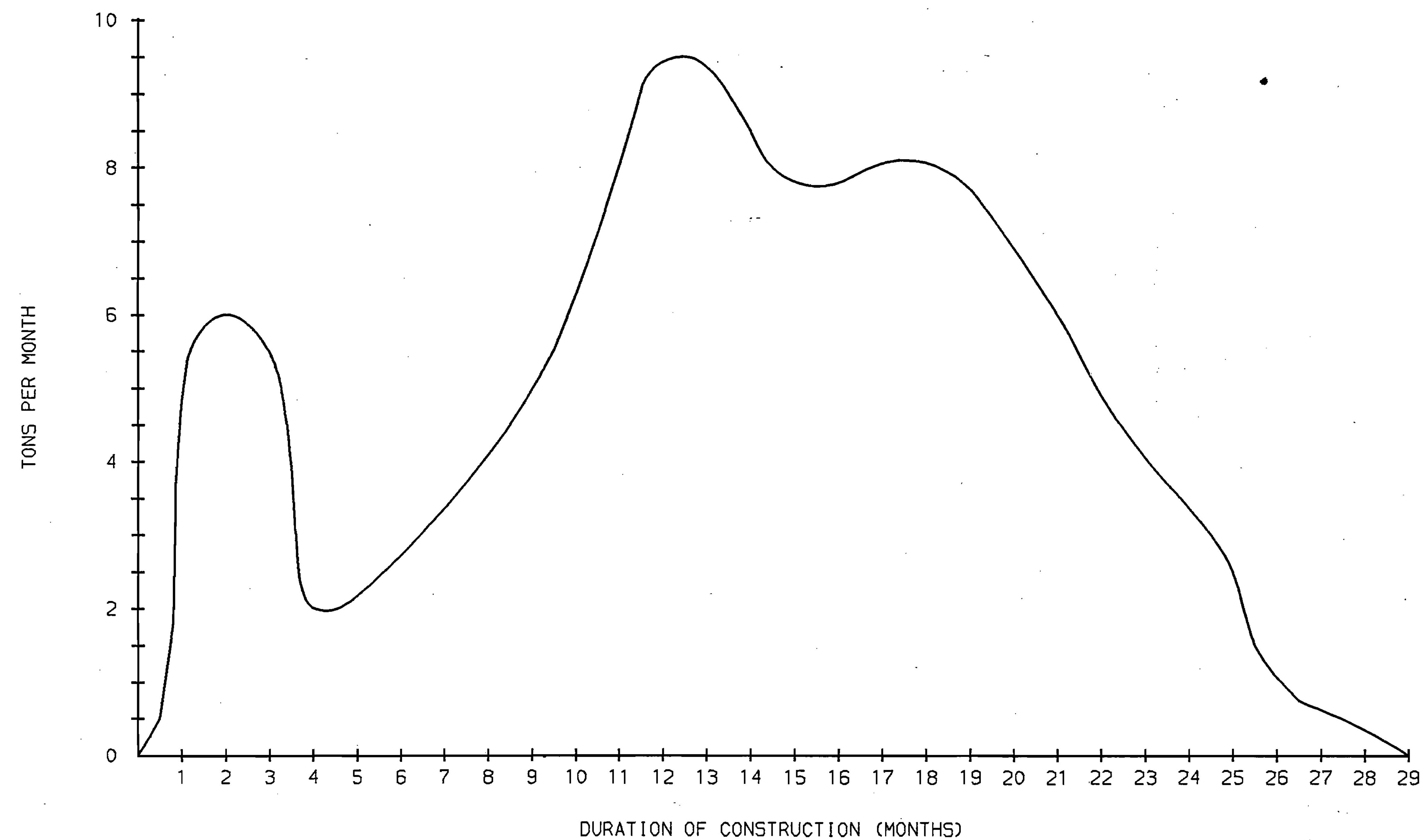
resource recovery facility. These wastes will include vegetation, trees, concrete, metal, paper, trash and oils and fluids required for equipment operations. They will be disposed of off-site.

The initial clearing of the facility and landfill sites will produce vegetative matter and wood and concrete debris. These types of wastes will be generated by the removal of vegetative ground cover, approximately 100 trees and demolition of two structures located on the southern portion of the site. All the debris will be hauled to the County 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., 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 4.1.4). 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.

FIGURE 4.1.4



BROWARD COUNTY

RESOURCE RECOVERY PROJECT

ESTIMATED SOLID WASTE GENERATED DURING CONSTRUCTION

4.1.2 Roads

On-site access roads will be the only roads constructed for this project. Access to and from the site will be from U.S. Route 441 (State Road 7) and therefore, no new public roads will be needed for this project. Improvement to Route 441 will be made by the Florida Department of Transportation.

4.1.3 Flood Zones

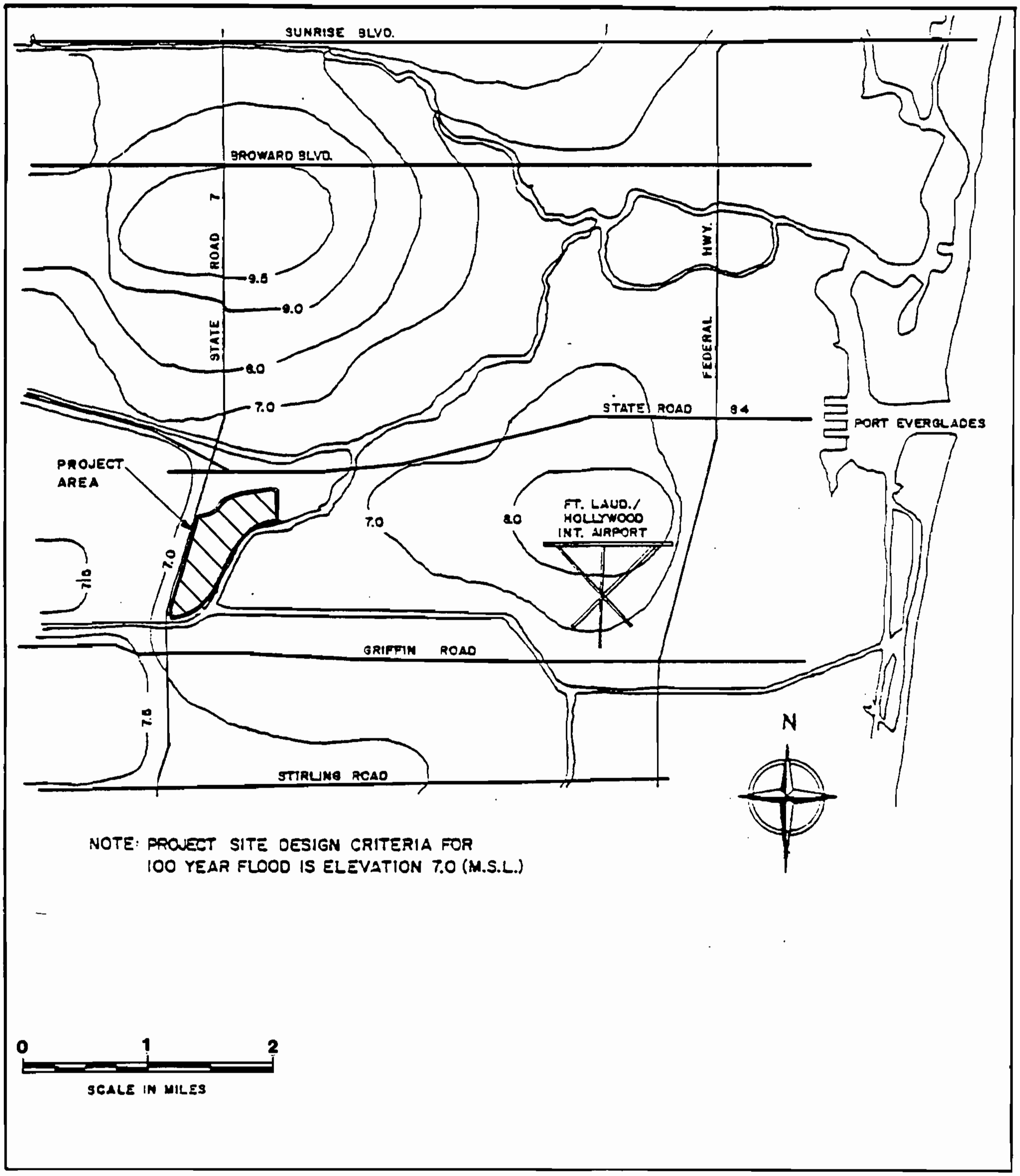
Fill material and piles will be utilized to ensure that none of the structures planned as part of this project or material placed in the landfill cells will be within the 100-year flood zone. Consequently, this section does not apply to this project. For information on the limits of the 100-year flood zone in the vicinity of the site refer to Figure 4.1.3.1.

4.1.4 Topography and Soils

The construction of three retention ponds and two landfill cells will alter the topography of the site. The three retention ponds will cover approximately 8.7 acres and be dredged down to -10 feet MSL, and the two landfill cells will cover approximately 147.6 acres and be filled to +7 feet MSL. Figure 4.1.3 shows the area of these basins.

Roads and buildings will cover more and more of the site as construction progresses. Approximately 336,750 square feet of impervious surfaces will cover the site by the end of construction. Buildings will cover approximately 124,000 square feet and roads and parking lots will cover approximately 212,750 square feet.

Due to these impervious surfaces the drainage features and percolation rates of the site will change. As summarized in Section 3.8, the addition of impervious surfaces to over 20 percent of the site area will result in an 80 percent increase in the rate of peak runoff. The total runoff volume will not be substantially affected by the increase in impervious sur-



Source: Board of County Commissioners Broward County, Florida

BROWARD COUNTY

100 YEAR FLOOD ELEVATION MAP

The subsurface conditions will be affected by the construction of the refuse bunker. The dimensions of the bunker will be 200 feet long, 50 feet wide and 23 feet deep. When the bunker is constructed, it will have to be excavated down to about twenty-six to twenty-seven 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 dredging and 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 to South Fork New River Canal 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 to the southern part because this is the only area near the site that is residential. Most of the landfill area construction will occur at or below grade, resulting in very limited visibility from nearby roadways and residential areas. However, backfilling activities to bring existing grade up to +7 feet MSL for the landfill and +27 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

The major activities described in the Instruction Guide will not be associated with this project. None of the construction activities are planned to occur in or near surface water bodies. However, there is one project activity which could affect nearby surface waters and that is the discharge of storm water runoff during construction.

The different construction activities, e.g., clearing of lands, excavation and backfilling, will result in an increase in site runoff during storms. This increased runoff will have more erosion potential because surface vegetation will be disturned or removed and steeper slopes will be created causing runoff to become sediment-laden. But, detention basins will be constructed at the beginning of the initial construction phase and they will hold the storm water prior to discharge. The design detailed in Appendix 10.13 ensures that all active portions of the site are drained into basins and those basins' depths and spillway heights are sufficient to ensure attenuation of peak discharge and retention of the first 1.4 inches of runoff. The basins have been designed to limit the volume and rate of discharge so that they do not exceed the values determined for the pre-developed site.

4.2.2 Measuring and Monitoring Programs

Section 2.3.4.1 describes the water sampling program conducted for this project. The baseline conditions were established and used to evaluate the potential impacts during construction.

The construction impacts will be minimized by the use of mitigation measures for the control of surface runoff and erosion and the construction of retention basins at the beginning of construction. These methods will effectively eliminate any adverse impacts to surface waters during construction.

4.3 Groundwater Impacts

The chemical quality of the local groundwaters will not be significantly affected by site preparation. The construction of the facility and the landfill will have no significant impact on groundwater levels either on site or off site. Ground water elevation on site is +1.0 feet NGVD, and the outfall structure to be constructed will be placed at +2 feet NGVD as per recommendation of Broward County Water Management Division. The outfall elevation will maintain existing ground water elevation in the area.

Site dewatering will not be necessary prior to construction of the refuse bunker, dredging out the detention ponds, or mucking out the landfill cells. The construction of the refuse bunker will use the slurry trench method and tremie concrete. Dredging out of the detention ponds and mucking out of the landfill cells will be accomplished by the use of a dragline. These methods will avoid impacts to the groundwater levels.

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 and landfill construction, site grading for drainage, preparation of retention basins, landfill cells and final site landscaping. The ecological features of the site will be modified as a result of construction, but the site has been previously disturbed for agricultural and marine industry purposes. The proposed mitigation plan (Appendix 10.7) will provide the floral species a more diverse and more productive habitat than currently exists, and 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.

In addition, the mitigation plan (Appendix 10.7), previously approved by the U.S. Army Corp of Engineers and Florida Department of Environmental Regulation, and the landscaping will improve the ecological productivity of this site.

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 108 acres (Table 4.5.1) of the facility and landfill sites will be exposed, and the greatest emission impacts from mobile sources occurring during the construction phase (Table 4.5.2) 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

TABLE 4.5.1

CONSTRUCTION ACTIVITIES IMPACTING FUGITIVE DUST

Construction Phase	Anticipated Areas to be Exposed Simultaneously	Estimated Area of Land Cleared (Acres)
SITE PREPARATION	First Landfill Cell	80.9
	Three Retention Ponds	8.6
	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 4.5.2
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	Sheet Pile Driving for Refuse Bunker	1 Pile Driver 1 Front End Loader	Localized
	Refuse Bunker Excavation	2 Backhoes 7 Trucks	
	Landfill Cells Excavation	4 Backhoes 12 Trucks	
	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

- 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.

o Particulate emissions across open and active construction areas:

  - Watering of the site would reduce emissions by 50 percent.

o 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 some farming. These land uses are not considered sensitive receptors for this report. The nearest sensitive receptor is the residential area south of the New River Canal. 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 500 personnel. The initial phase of construction (site clearing, access roads, excavation of retention ponds and filling of the landfill cell) 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.

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.

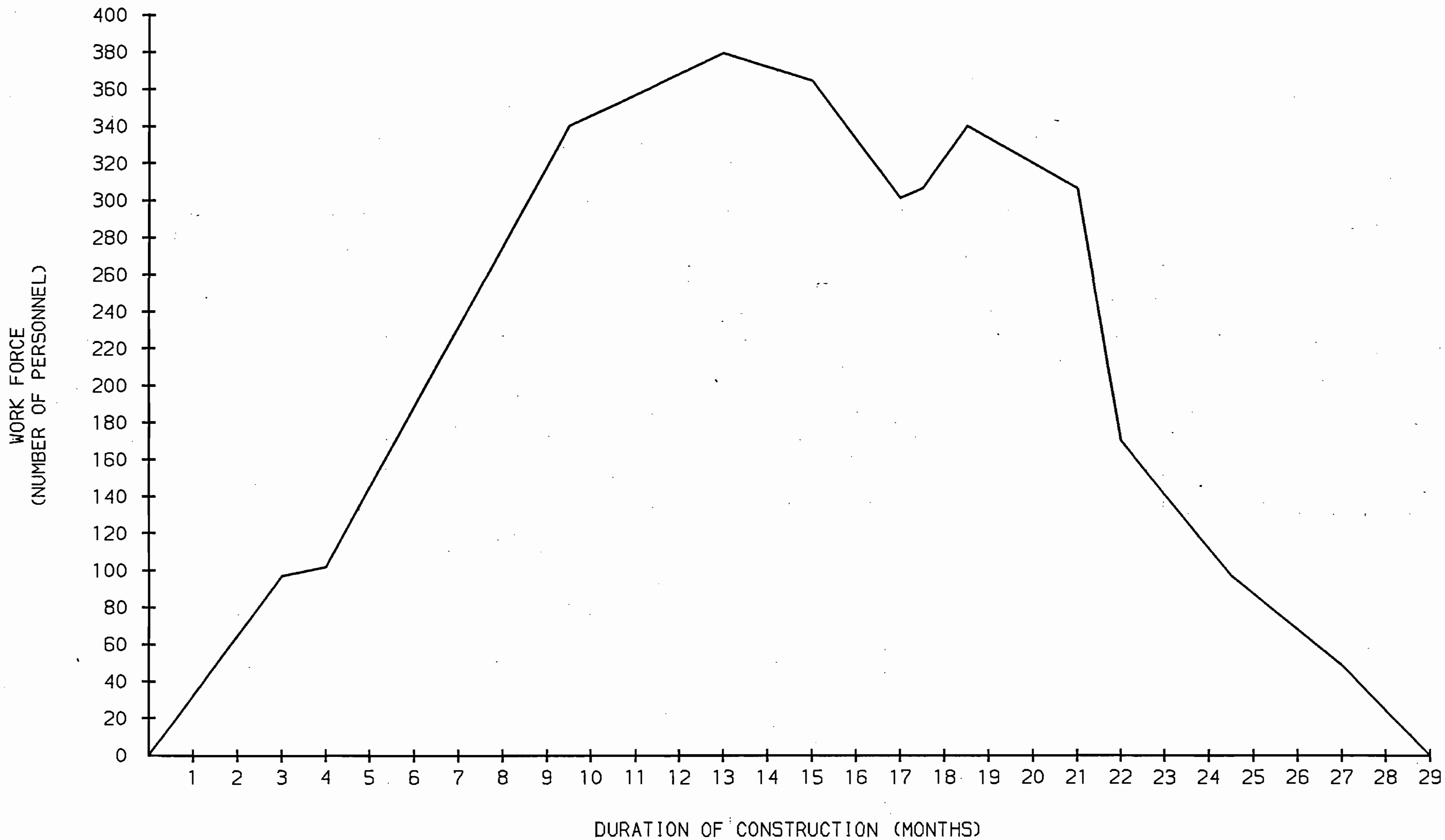
It is anticipated that local construction and equipment suppliers will realize both direct and indirect benefits from both the construction and operation of the resource recovery facility.

4.6.3 Traffic Associated with Construction

Traffic due to construction will enter and exit the site by way of Route 441. This traffic will consist of the daily work force, delivery of construction equipment and delivery of construction materials (Figure 4.6.3.1).

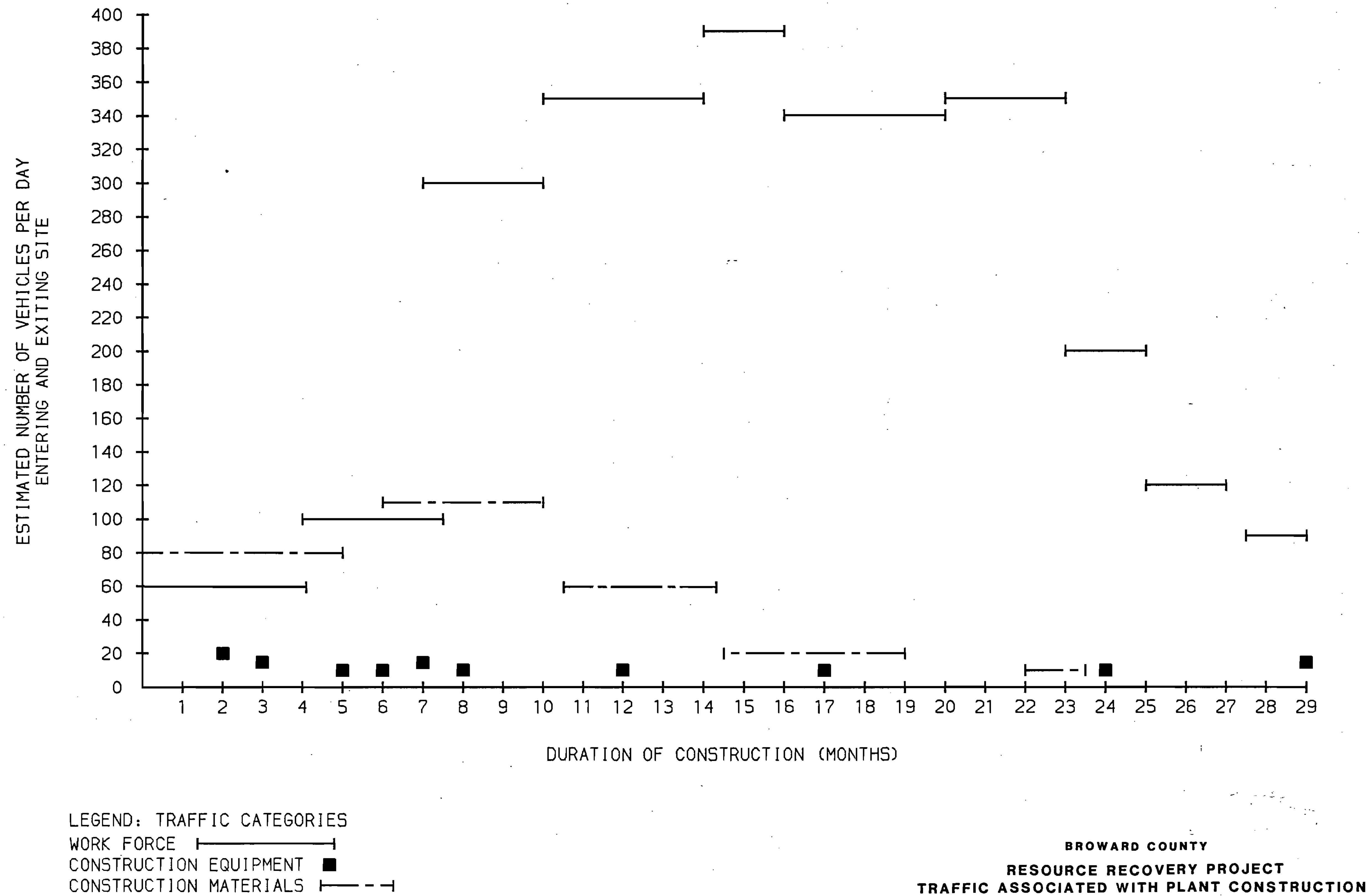
The general work force traffic will average about 80 vehicles per day for the first eight months, and then average about 350 vehicles per day for the next sixteen months. After the twenty-fourth month, the general work force traffic will fall off as construction is completed. The greatest impact of this 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.

FIGURE 4.6.2.1



BROWARD COUNTY

RESOURCE RECOVERY PROJECT
ESTIMATED WORK FORCE REQUIREMENTS DURING CONSTRUCTION



BROWARD COUNTY

RESOURCE RECOVERY PROJECT
TRAFFIC ASSOCIATED WITH PLANT CONSTRUCTION

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 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 Route 441 in the 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, 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 is located in a portion of the Local Area of Particular Concern (LAPC) and a proposed urban wilderness area. the site adjacent to the New River. The area was so designated because it is part of the last vestige of natural vegetation along South Fork New River. The 300-wide strip adjacent to the river will be preserved and enhanced by the mitigation plan (Appendix 10.1.4). In fact the mitigation plan includes extension of the preservation and enhancement area along the entire waterfront and not just that part designated as urban wilderness.

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:

- Adequate Disposal
- Economic Viability
- Environmental Security
- Energy Production
- Local Economy Stimulers, and
- Social Enhancement.

4.11 Variances

No variances from standards or guidelines are anticipated for this project.

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 an air cooled condenser. Condensate from the turbine-generator will be collected, processed and returned to the deaerator. Steam pressure reducing valves and desuperheaters 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.

5.1.1 Temperature Effect on Receiving Body of Water

This section is not applicable to the project since there will be no heated effluent discharged from the resource recovery facility into any body of water. Any discharge will be directed into the head works of the Hollywood Wastewater Treatment Plant. The amount of discharge is considered to be minimal since the facility is designed to recirculate wastewater for use in ash quenching.

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 potable water supplied by either Broward County or the City of Fort Lauderdale. The Broward County water supply can be made available to the facility via an 8-inch diameter water line adjacent to the site and a 6-inch diameter force main located just south of the site. The City of Fort Lauderdale water supply could be made available by tapping their water main extension located adjacent to the site. Discharges from the resource recovery facility will flow to existing sanitary sewer lines located directly adjacent to the site. As such, no water body will be directly affected by the resource recovery facility water demand or discharge. Figure 5.1.3.1, provides details of the utility locations adjacent to the Route 441 Project site. Stormwater runoff is discussed in Section 5.

5.1.4 Effects of Offstream Cooling

This section, as described, is not applicable to the project since the air cooled system proposed will not have a measurable impact on the local environment.

5.1.5 Measurement Program

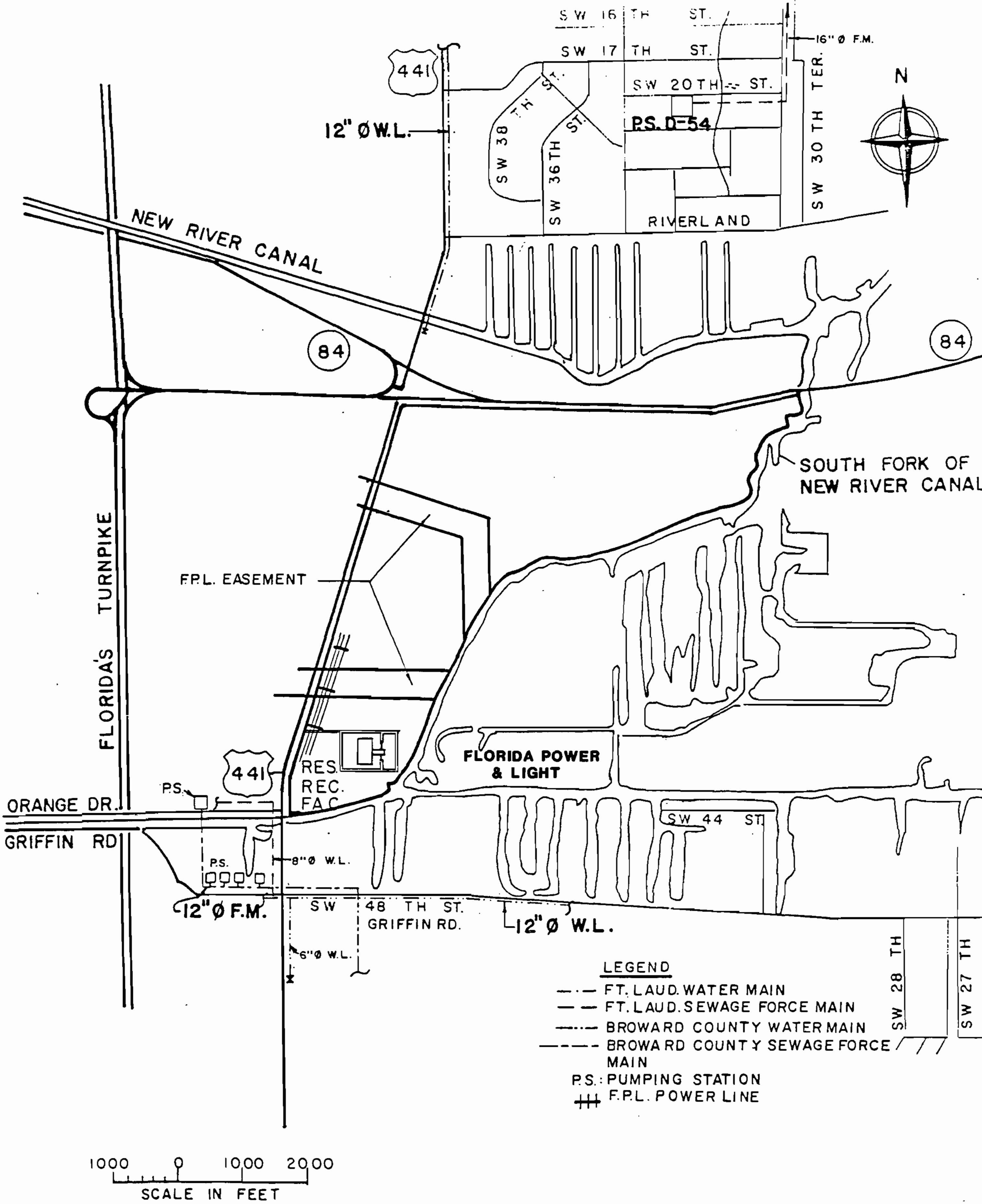
Programs and methods for measuring the physical and chemical parameters of waters which will be affected during operation of the facility are not applicable to the project because no water body will be directly affected by the operation of the facility.

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 and associated ash residue/unprocessable waste landfill. Effluent from all site facilities

FIGURE 5.1.3.1



BROWARD COUNTY
RESOURCE RECOVERY

UTILITY LOCATIONS
ADJACENT TO THE
ROUTE 441 SITE

will go directly to the Hollywood Wastewater Treatment Plant (HWWTP). 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

The resource recovery facility will dispose of its air cooled condenser and boiler blowdown along with its other process water wastes at the HWWTP. As a result, there will be no effect of chemicals in the blowdown wastewater on the environment.

5.2.3 Measurement Programs

Waste process water flow quantities to the city sewer will be monitored by a sewer meter to be installed on the site.

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 and ash residue/unprocessable waste landfill has been developed in order to have a minimal impact, both quantitative and qualitative, on groundwater or surface water supplies.

The two major sources of potential impact on water supplies from the facility and associated landfill are from on-site surface water runoff and landfill generated leachate. Section 3.8, On-Site Drainage System, describes how uncontaminated stormwater runoff (runoff which does not come in contact with landfill materials) will be collected, retained and treated in order to conform with state and local regulations.

Presented below is the conceptual landfill design which describes the development and operation of the landfill. The goal of the conceptual design is to provide maximum groundwater protection, good surface water flow controls, and efficient and effective site operations, all in accordance with federal state and local regulations.

Conceptual Landfill Design

The following description of the construction and operation of the residue/unprocessable waste landfill appeared in American Ref-Fuel's proposal dated November 16, 1984. Preliminary discussions with the County indicate that this is the type of landfill design, i.e., utilizing a double synthetic membrane liner with a leachate collection and leak detection systems, desired as part of this facility's construction. It should be noted that this concept is referenced in order to provide a description of the preliminary development of the landfill design and associated facilities; it in no way represents a preference toward vendor selection. Detailed design may ultimately utilize various methods and materials in order to arrive at the same goal.

General

The proposed design was developed to meet Florida Department of Environmental Regulation (DER) regulations and adhere to sound engineering principles. The highlights of the design criteria are as follows:

- 200-ft. buffer zone.
- Lowest waste elevation is above the 100-year flood elevation of 7.0 ft.
- Contaminated surface runoff and leachate are collected and pumped to a sanitary sewer.
- Maximized site life by filling to elevation 140.00, on 3 horizontal:1 vertical side slopes.
- Double liner, leachate collection system, and contingency leachate collection system to provide maximum environmental protection.

- o Final cap design utilizing locally available materials that will impede rainfall percolating into the waste to reduce leachate generation.

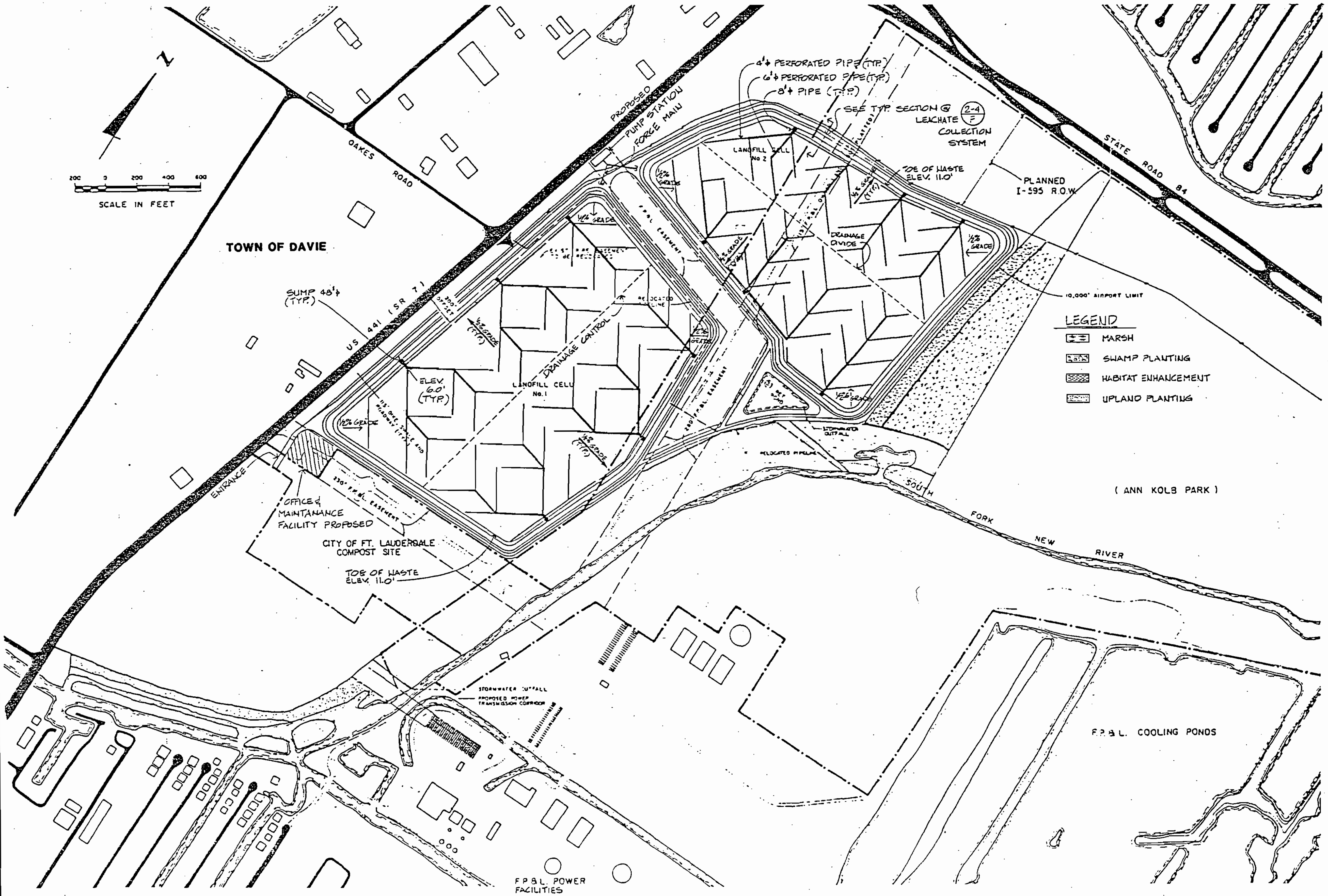
Figures 5.3.1 through 5.3.7, provide an illustrative example of the landfill plan and details. The discussion on landfill design presented below supercedes the information provided in the design drawings.

Leachate Control

The layout and slope of the primary liner, leachate collection and removal system has been designed to minimize the travel distance of fluid through the perforated pipe network, thereby decreasing the amount of structural fill required and reducing the possibility of clogging. Six sumps will be installed in each cell to collect the leachate. The sump pump discharges will be connected by a 3-in. diameter force main system which has sufficient capacity for the selected 30 gpm pumps. The leachate will flow to the existing pump station and then to the Hollywood Wastewater Treatment Plant (HWWTP).

A contingency collection system has been added underneath the leachate collection system. This additional system will be able to detect and collect leakages in the leachate collection system. The contingency system design consists of a 40 ml HDPE liner, sloped "geonet" to collect and transport leachate to the 6-in. diameter collection pipes, and 8-in. diameter PVC pipe to carry the leachate from the collection pipes to separate sumps located adjacent to the leachate collection sumps. A "geonet" is a manmade drainage blanket (subsituting for sand or gravel) consisting of transverse strands of polyethylene fibers. The "geonet" is relatively thin, about 1/3-inch. thick, but a 22-ft. width of the material can transport as much fluid as a 4-in. diameter pipe flowing full.

FIGURE 5.3.1



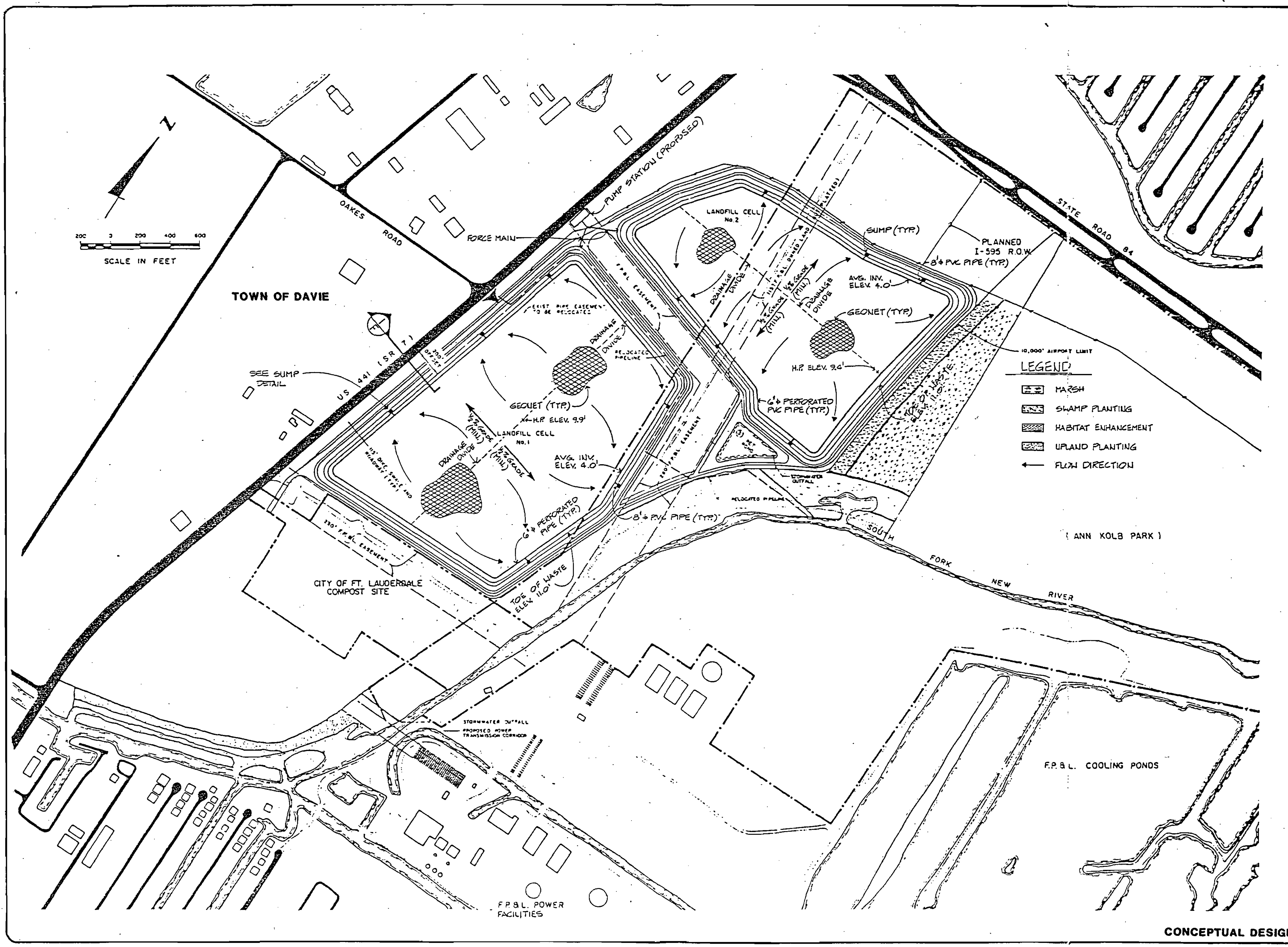
CONCEPTUAL DESIGN

REV.	DESCRIPTION	DATE	BY

BROWNING-FERRIS INDUSTRIES
ENGINEERING SERVICES
14701 SAINT MARY'S STREET · P.O. BOX 3151 · HOUSTON, TEXAS 77001 · (713) 870-8100

TITLE: LEACHATE COLLECTION SYSTEM
PROJECT NAME & LOCATION: PROPOSED LANDFILL DESIGN
SOUTHERN RESOURCE RECOVERY FACILITY
BROWARD COUNTY, FLORIDA
SCALE: 1" = 300'
DATE: 10-31-83
ENGINEER: G. HOY
DRAWN BY: J.W. GAY
APPROVED BY:
PROJECT NUMBER:
DRAWING NUMBER: A
OF

FIGURE 5.3.2



CONCEPTUAL DESIGN

REV | DESCRIPTION | DATE | BY

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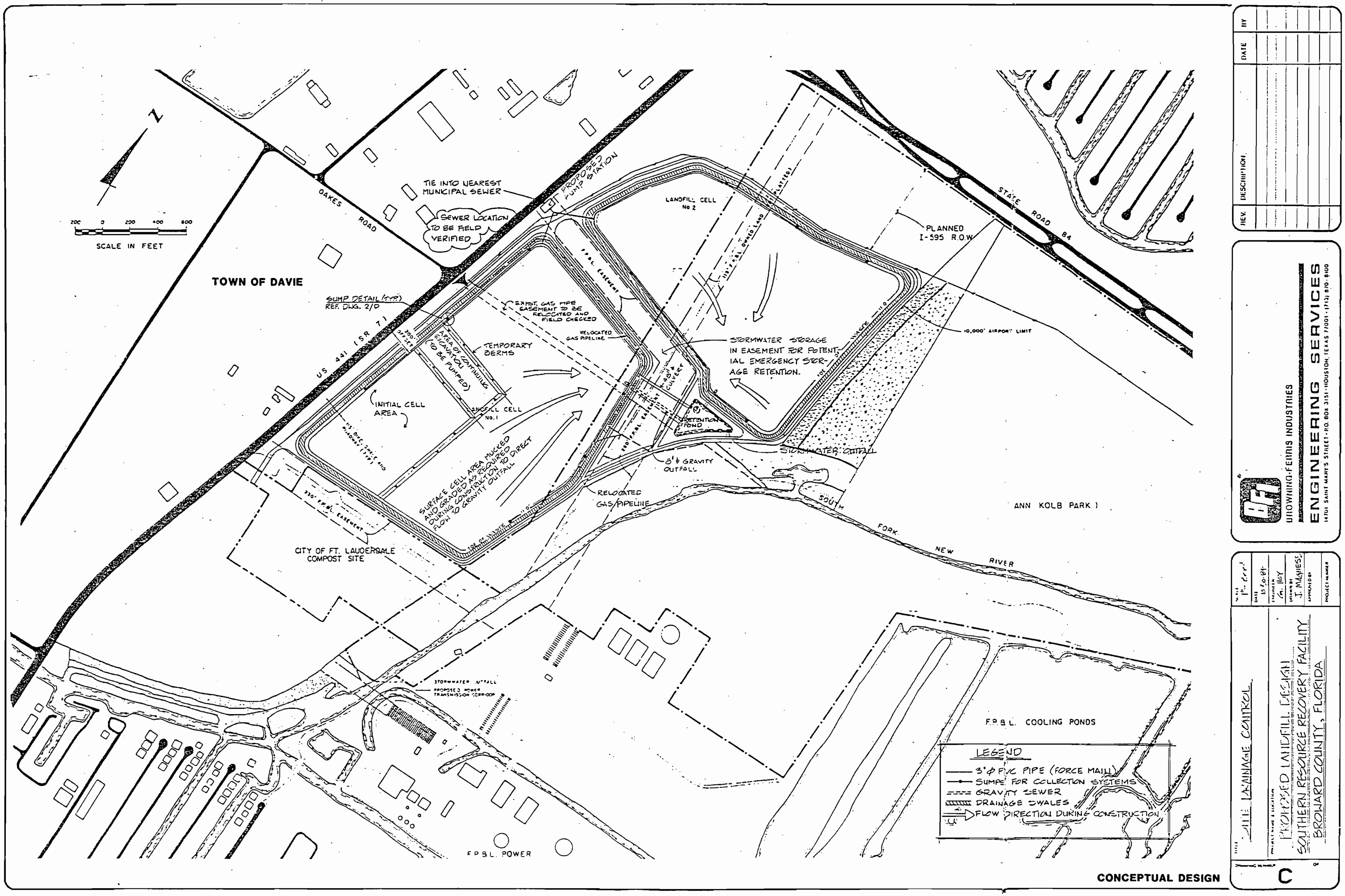
CONTINGENCY COLLECTION SYSTEM
PROPOSED LANDFILL DESIGN
SOUTHERN RESOURCE RECOVERY FACILITY
BROWARD COUNTY, FLORIDA

SCALE 1" = 300'
DATE 12-22-84
G. HOY
J.W. GAY

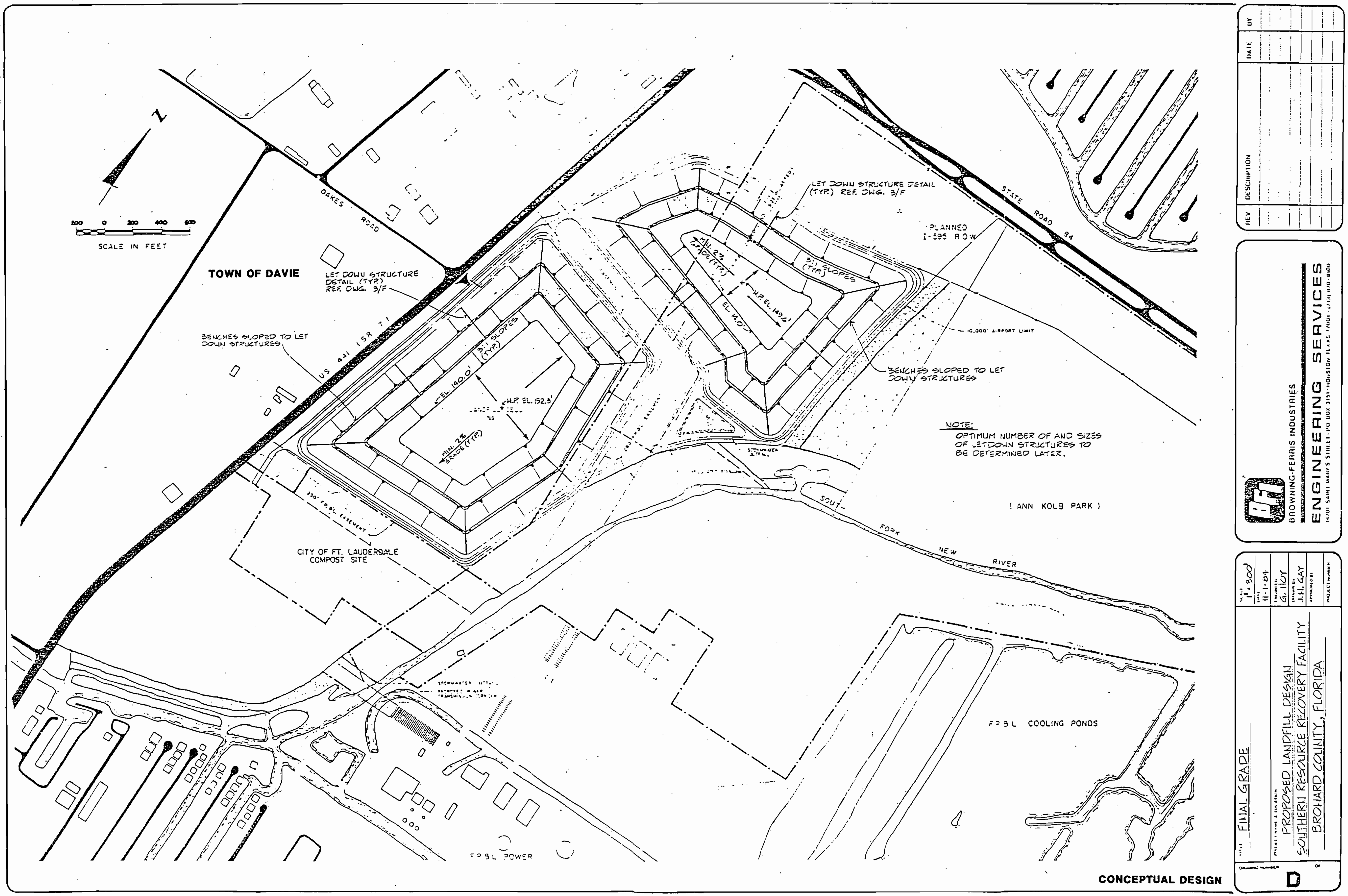
B

FIGURE 5.3.3


TOWN OF DAVIE
SCALE IN FEET
OAKES ROAD
US 441 (SR 7)
STATE ROAD 84
TIE INTO NEAREST MUNICIPAL SEWER
PROPOSED PUMP STATION
SEWER LOCATION TO BE FIELD VERIFIED
SUMP DETAIL (TYP.) REF. DWG. 2/D
EXIST. GAS PIPE EASEMENT TO BE RELOCATED AND FIELD CHECKED
RELOCATED GAS PIPELINE
TEMPORARY BERMS
INITIAL CELL AREA
LANDFILL CELL No.1
LANDFILL CELL No 2
SURFACE CELL AREA MUCKED AND GRADED AS REQUIRED DURING CONSTRUCTION TO DIRECT FLOW TO GRAVITY OUTFALL
STORMWATER STORAGE IN EASEMENT FOR POTENTIAL EMERGENCY STORAGE RETENTION.
RETENTION POND
8'ϕ GRAVITY OUTFALL
RELOCATED GAS PIPELINE
STORMWATER OUTFALL
PLANNED I-595 R.O.W.
10,000' AIRPORT LIMIT
ANN KOLB PARK
SOUTH FORK NEW RIVER
CITY OF FT. LAUDERDALE COMPOST SITE
F.P.&L. COOLING PONDS
F.P.&L. POWER
STORMWATER OUTFALL
PROPOSED POWER TRANSMISSION CORRIDOR
LEGEND
3'ϕ PVC PIPE (FORCE MAIN)
SUMPS FOR COLLECTION SYSTEMS
GRAVITY SEWER
DRAINAGE SWALES
FLOW DIRECTION DURING CONSTRUCTION
REV. DESCRIPTION DATE BY
BROWNING-FERRIS INDUSTRIES
ENGINEERING SERVICES
14701 SAINT MARY'S STREET • P.O. BOX 3151 • HOUSTON, TEXAS 77001 • (713) 870-8100
SITE DRAINAGE CONTROL
PROPOSED LANDFILL DESIGN
SOUTHERN RESOURCE RECOVERY FACILITY
BROWARD COUNTY, FLORIDA
J. MATHIESS
C
CONCEPTUAL DESIGN

Best Available Copy

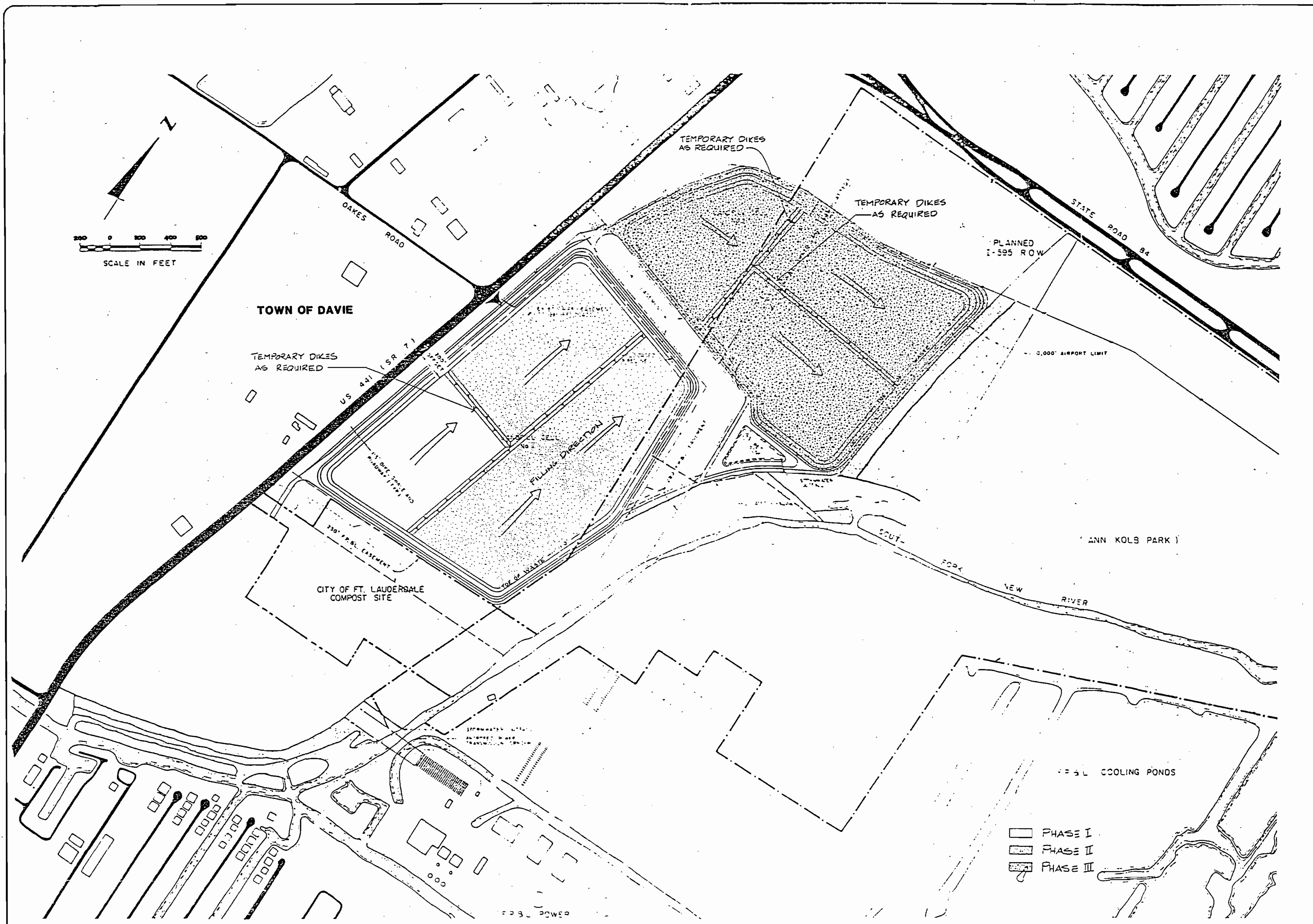
FIGURE 5.3.4



CONCEPTUAL DESIGN

Best Available Copy

FIGURE 5.3.5



CONCEPTUAL DESIGN

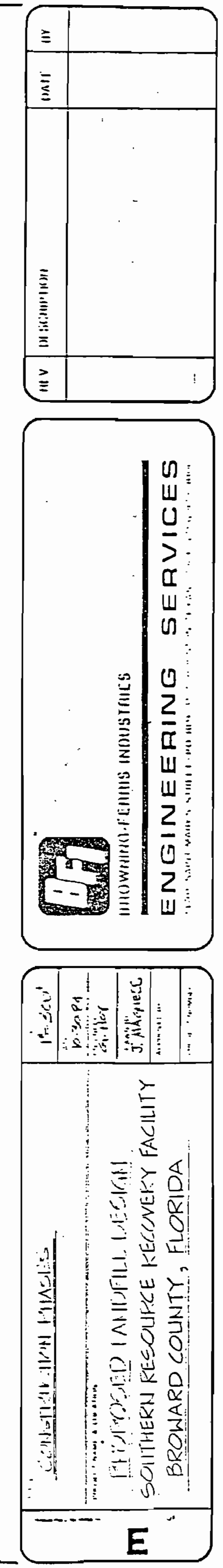
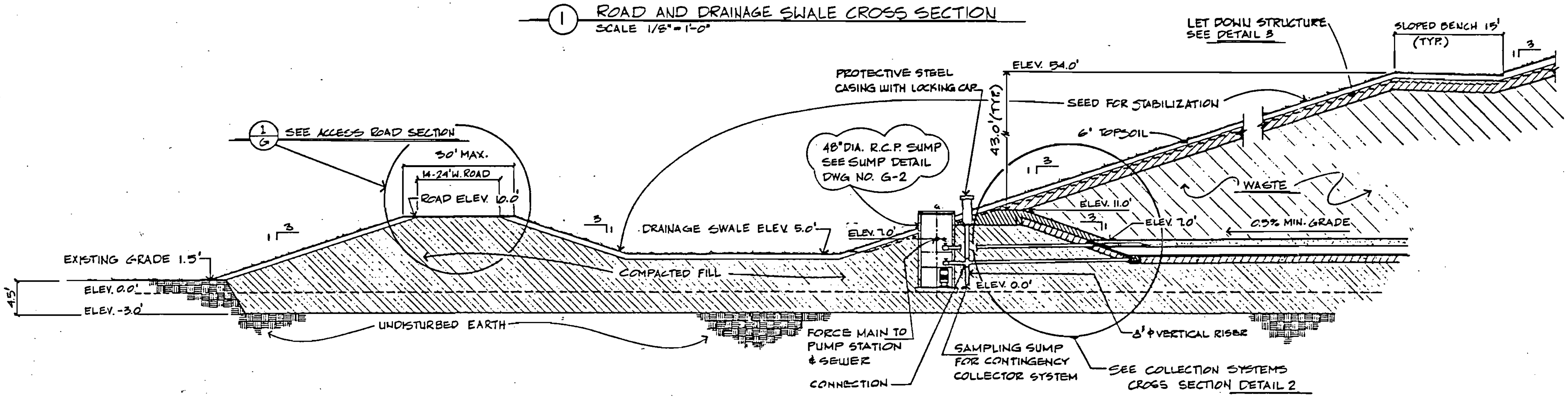
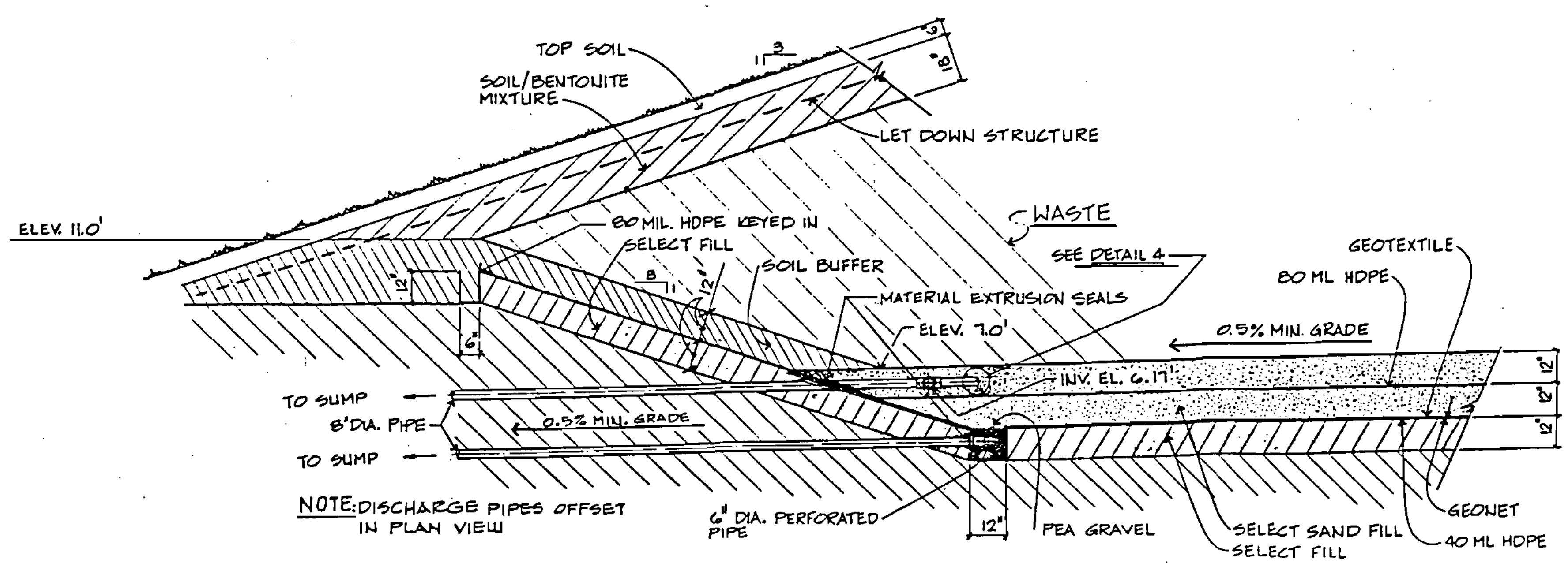


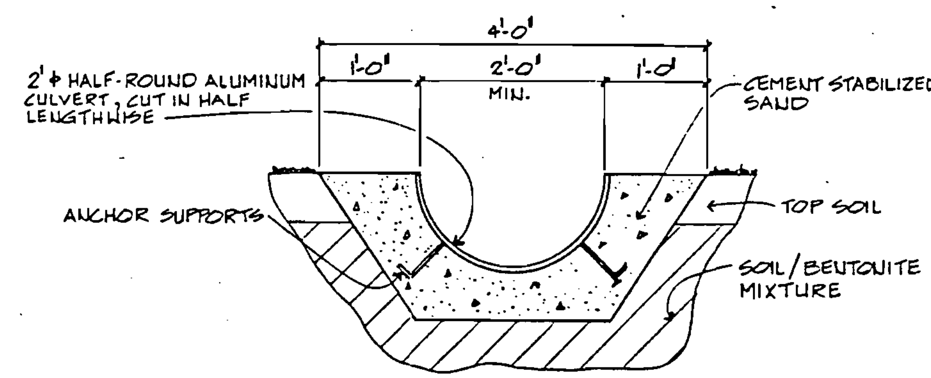
FIGURE 5.3.6



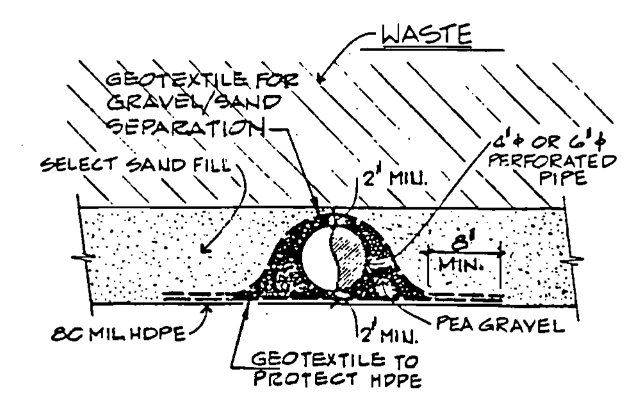
1 ROAD AND DRAINAGE SWALE CROSS SECTION
SCALE 1/8" = 1'-0"



2 COLLECTION SYSTEMS CROSS SECTION
SCALE 3/8" = 1'-0"



3 LET DOWN STRUCTURE DETAIL
1" = 1'-0"



4 TYPICAL SECTION @ MANIFOLD
1" = 1'-0"

CONCEPTUAL DESIGN

REV.	DESCRIPTION	DATE	BY

BROWNING-FERRIS INDUSTRIES
ENGINEERING SERVICES
14701 SAINT MARY'S STREET • P.O. BOX 3151 • HOUSTON, TEXAS 77001 • (713) 870-8100

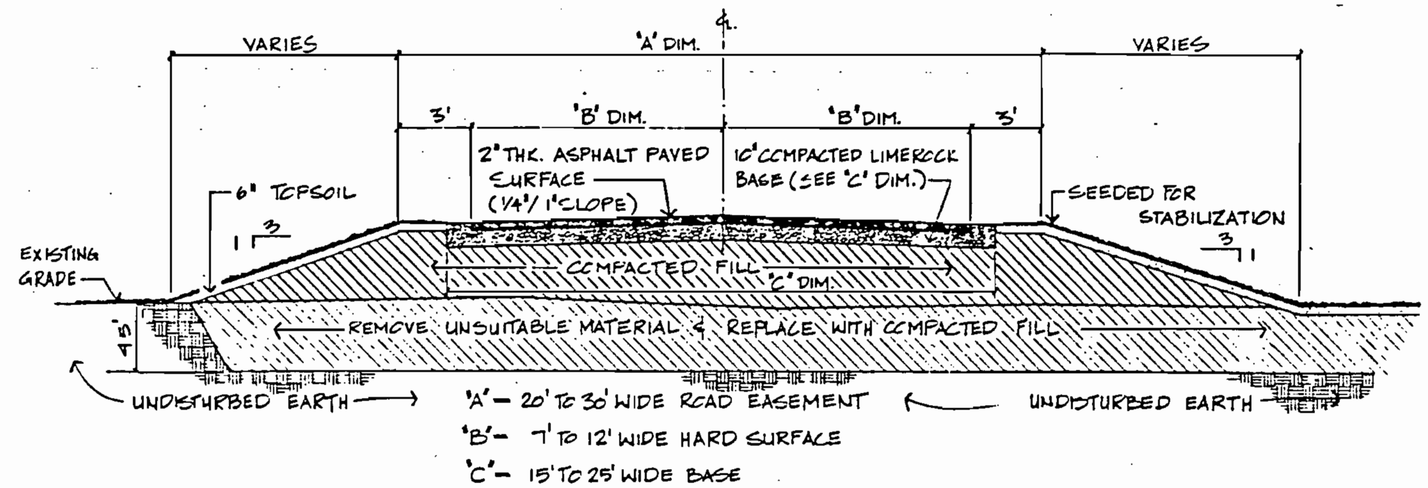
TITLE: SECTIONS & DETAILS

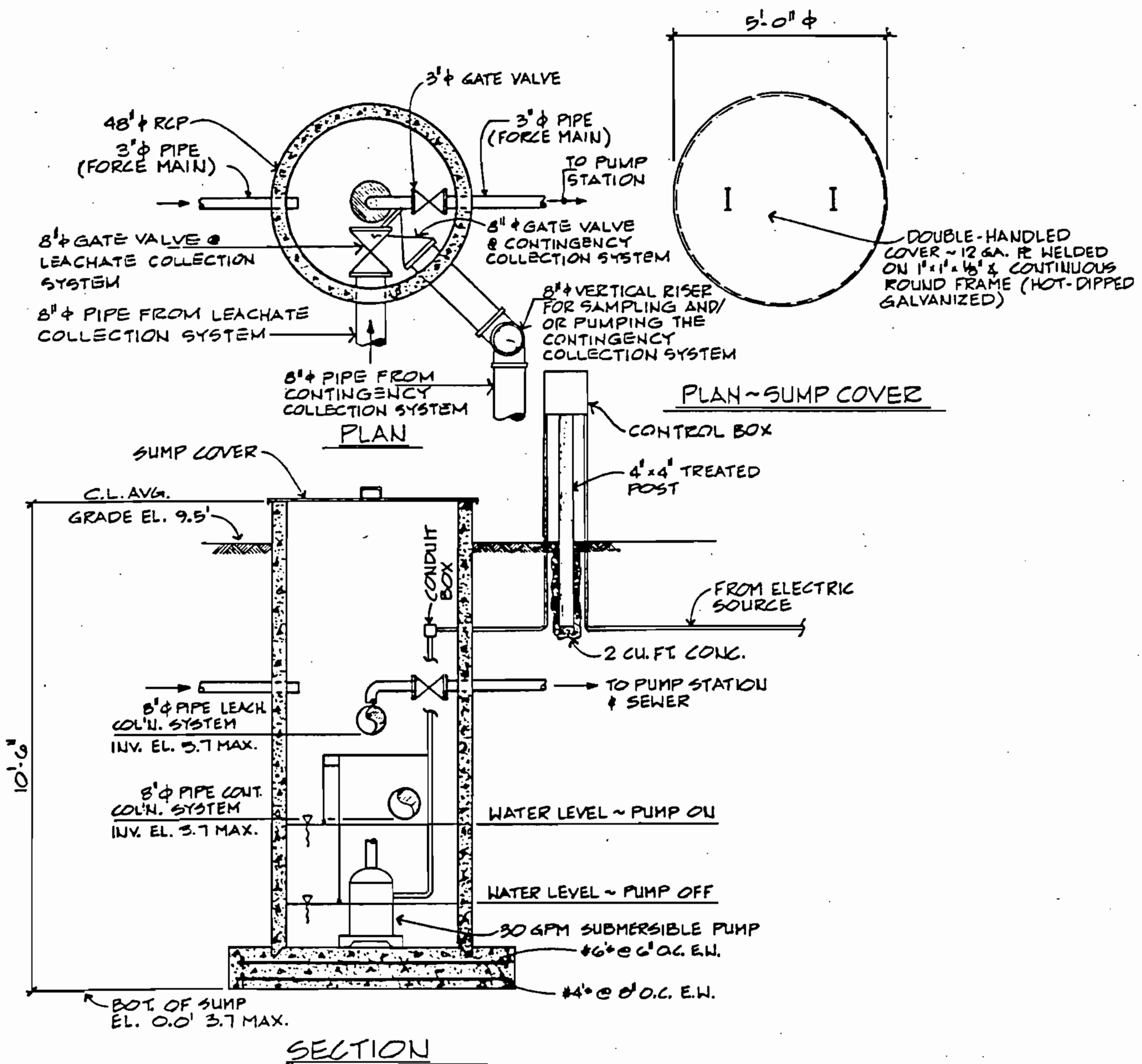
PROJECT NAME & LOCATION: PROPOSED LANDFILL DESIGN, SOUTHERN RESOURCE RECOVERY FACILITY, BROWARD COUNTY, FLORIDA

SCALE: NOTED
DATE: 11-1-84
ENGINEER: G. HOY
DRAWN BY: J.M./J.G.
APPROVED BY:
PROJECT NUMBER:
DRAWING NUMBER: F

FIGURE 5.3.7

1 LANDFILL ACCESS ROAD CROSS SECTION





2 TYPICAL SUMP DETAIL
1/2" = 1'-0"

CONCEPTUAL DESIGN

REV.	DESCRIPTION	DATE	BY

BROWNING-FERRIS INDUSTRIES
ENGINEERING SERVICES
14701 SAINT MARY'S STREET · P.O. BOX 3151 · HOUSTON, TEXAS 77001 · (713) 870-8100

TITLE: PLANS, SECTIONS & DETAILS
PROJECT NAME & LOCATION: PROPOSED LANDFILL DESIGN, SOUTHERN RESOURCE RECOVERY FACILITY, BROWARD COUNTY, FLORIDA
SCALE: NOTED
DATE: 11-1-84
ENGINEER: G. HOY
DRAWN BY: J.W. GAY
APPROVED BY:
PROJECT NUMBER:
DRAWING NUMBER: G
OF

The additional collection system is necessary to provide a method of collecting and detecting any leachate from potential leaks. The combination collection and contingency collection system offers a high degree of groundwater protection to the Biscayne Aquifer underlying the site.

Final Slopes

The final outside slopes will be at 3 horizontal:1 vertical and have 24-in. thick final cover. The top of the landfill will have a 2 percent to 4 percent slope to provide adequate runoff.

Three, 15-ft wide benches (one every 43 vertical feet) will decrease surface flow velocities on the 3 horizontal:1 vertical slopes to reduce erosion potential. The benches will be sloped 'inward' and toward let-down structures such that flow is directed to the drainage swales at the base of the slope.

Final Cap

The type of final cap material proposed is a soil/bentonite mixture topped with 6 additional inches of soil with a vegetative cover. Ordinarily, clay is used for a final cap. However, the unavailability of this material indicates that 18 inches of a soil/bentonite mix is the best alternative to achieve a 10^{-7} permeability. Six inches of topsoil with vegetative cover will be placed over the soil/bentonite material. This design should provide a final cap that: (a) meets Florida DER criteria, (b) remains stable, (c) supports vegetation to minimize erosion, and (d) reduces infiltration into the landfill.

Stormwater Retention Area

A stormwater retention pond has been sized as large as possible to maximize retention time and capacity. The pond is fed uncontaminated surface runoff by two sources: cell construction area runoff (via 8-in. diameter gravity outfalls) and final slope area runoff (via let-down structures and drainage swales). The pond serves only as a retention area for uncontaminated water before being discharged through the stormwater outfall into the river. Unlined portions of both cells may also be utilized as retention areas.

As Cell 2 nears completion it may be necessary to utilize the FP&L easement as an emergency retention area.

A more detailed description of site drainage provision is provided in Section 3.8, On-Site Drainage System.

Staging

A three-phase landfill operating plan has been developed to minimize site visibility, optimize construction, and minimize the amount of surface runoff that is routed for treatment during construction.

Filling the west side of each cell first will create a "visual block" for the remainder of the cell as construction progresses. The proprosed filling direction also optimizes haul routes and construction sequences.

Temporary dikes and grading during construction will be used to direct surface flow through 8-in. diameter outfalls to the retention area.

Phase I - Initial Construction

Construction Sequence

- Site Survey - A site survey will be conducted to determine site boundaries, buffer zones, and control points.

- Clearing - The initial clearing area includes the entrance roads; Cell 1 and Cell 2 berms; swales and roads, stormwater retention area, pump station and office areas; and the initial disposal area.

- Mucking Out - An estimated 4.5 ft. of unsuitable material will be removed and stockpiled. The cell construction area will be graded toward the Cell 1 gravity outfall which routes runoff to the retention pond. Cell 2 will be cleared and used as a retention area.

- Backfilling and Construction - Phase I areas will be backfilled to design grades. The areas include roadways, drainage swales, stormwater area, pump station, and maintenance yard. Disturbed areas in which filling is the final stage of construction will be revegetated. Dust and silt control devices will be installed as required.

- Monitor Wells - Monitor wells will be installed around the site to monitor upgradient and downgradient ground water.

<u>Preparation of Initial Disposal Area</u>

- Construction of three sump sets (leachate and contingency) on the western side of the cell, and their connecting 3-in. diameter force mains. The eastern side of the cell will be used to collect uncontaminated runoff.

- Placement and grading of a minimum of 1 ft. of select fill on the floor and side slopes of the initial cell area.

- Construction of contingency collection system which includes installation:

    - 40 mil High Density Polyethylene (HDPE) liner

    - 6-in. diameter perforated collection pipes

    - 8-in. diameter discharge pipe to carry flow from the system to the sumps

    - "Geonet" to facilitate leachate flow

    - "Geotextile" (a synthetic porous reinforcing fabric) to protect the "geonet"

    - Select sand and/or gravel fill to protect the 40 mil HDPE and serve as an additional drainage blanket.

- Construction of leachate collection system which includes installation of:

- 80 mil HDPE liner and protective "geomembrane"

- 4-in. diameter and 6-inch. diameter perforated PVC manifold system

- Select sand and/or gravel fill drainage blanket

o Placement of 1-ft soil buffer on side slopes.

o Preparation of roads for waste handling vehicles.

Filling Waste

The initial cell area will have about 753,000 cy of available capacity. An approximate life of about 1½ years is projected using available waste generation data.

While the initial cell area is being filled, water which contacts waste is routed to the sumps and thence to the sewer. Temporary dikes will separate the excavation area from the remainder of the cell. All other surface flow from the open cell area is routed through the gravity outfall to the detention pond. (Specific operation procedures are discussed later.)

Phase II - Construction

Construction Sequence

Phase II is the construction of the remainder of Cell 1. Phase II will follow the same construction procedure as that of Phase I to prepare the cell area.

Filling Waste

As Cell 1 nears capacity, construction and preparation will begin on Cell 2. The unlined area of Cell 2 could be used as a stormwater retention area as the Cell 1 retention area decreases. The total projected available capacity of Cell 1, including Phase I volume, is about 6,500,000 cy, or about 12 to 13 years of life.

The waste will be filled from south to north. Surface flow will be directed through the 8-in. diameter gravity outfall from Cell 2 to the retention pond.

Phase III - Construction

Construction Sequence

Phase III is the construction of the remainder of Cell 2. The construction sequence is the same as that of Cell 1. The total projected available capacity of Cell 2 is about 4,300,000 cy, or about 7 to 8 years life. The total estimated life of the entire landfill site, including Cells 1 and 2, is about 20 years.

Cover

Daily Cover

At least 6 inches of suitable cover will be placed over the waste at the end of each day. Ash residue or a mixture of ash residue and soil will be used for daily cover.

Intermediate Cover

Intermediate cover will be applied to all landfill surfaces and slopes which will not receive additional refuse for two months or more. This cover will be placed to a minimum compacted thickness of one foot (including daily cover). When landfilling operations begin again in areas with intermediate cover, the cover will be stripped from the surface and stockpiled. When each operating area is brought to intermediate grade and intermediate cover is applied, the surface will be graded with a minimum 2 percent slope and maintained to prevent the formation of standing water. These areas will also be seeded to prevent erosion.

Final Cover

As soon as practical after an area reaches final grade, the final cover will be applied and the area revegetated. In this way, the volume of leachate produced at the landfill will be minimized.

5.3.1 Surface Water

There are no proposed surface water withdrawals or discharges associated with the operations of the resource recovery facility and ash residue/unprocessable waste landfill. All plant water intake will be via City or County Utility Division water mains while all facility discharges, i.e. sanitary sewage, and surplus boiler and cooling tower blowdown, will be to the HWWTP.

Stormwater runoff will be controlled in accordance with SFWMD requirements as described in Section 3.8, On-Site Drainage.

Potential impact from surface runoff of leachate will be prevented by utilizing temporary berms to separate contaminated stormwater runoff (i.e. stormwater which comes in contact with landfilled materials) from uncontaminated stormwater runoff. Contaminated stormwater will be treated as leachate, contained by the impermeable liner and collected by the leachate underdrain system. A detailed description is provided in Section 5.3, Impacts on Water Supplies.

5.3.2 Groundwater

The only plant pollutant capable of having a potential impact on groundwater supplies at the project site will be the leachate generated at the residue/unprocessable waste landfill. Thus, in the landfill design major importance has been placed on the protection of the groundwater aquifer so as to virtually eliminate the possibility of adverse impact.

The geology at the site, as described in Section 2.3 is rather typical of the entire Broward County area. Consequently, there is a lack of sizable quantities of suitable clays from which recompacted or remolded clay liners can be constructed. Therefore, flexible membrane liners (FML) were chosen to provide containment of the landfill leachate and promote flow to the leachate collection and removal system(s).

There has been a sufficient amount of laboratory and field performance data made available by the EPA (see Appendix 10.14 for references cited) and by synthetic liner manufacturers and installers on which to base the following conclusions:

- o The use of synthetic membrane liners as a means to prevent groundwater contamination by leachate from waste impoundment facilities is a highly developed and proven technology.

- There are many varieties of synthetic liner materials available, each characterized by specific physical and chemical properties. For a given landfill environment there usually exist several varieties of synthetic liner materials which exhibit excellent physical and chemical compatibility.

- There are many waste impoundment facilities in the United States which for the past 10 to 15 years have utilized synthetic membrane liner materials to protect groundwater resources. These facilities include municipal solid waste landfills, hazardous waste landfills and lagoons, as well as ash residue landfills associated with coal fired power plants.

- The EPA, under the most recent RCRA guidelines for the disposal of hazardous waste, views synthetic liner materials as the only low permeability membranes which will effectively prevent groundwater contamination. If synthetic liner materials can successfully be utilized to contain highly acidic, basic or corrosive liquids in a lagoonal environment, for example, then these same materials exposed to municipal solid waste leachate should exhibit superior performance.

- Proper design considerations (subgrade preparation and liner selection), quality control during construction (seaming and liner soil cover), and consistent facility operation practices (fire control and prevention of the dumping of incompatible wastes) are all important variables in successful liner performance.

Appendix 10.14 is a report prepared by Malcolm Pirnie, Inc. for Broward County describing the current technology associated with synthetic membrane liners.

The FML selected for the site is High Density Polyethylene (HDPE). Experience at various waste disposal sites (see Appendix 10.14 for examples) has shown HDPE to be one of the most physically durable and chemically resistant products currently available on the market. In addition, this material provides a very positive seaming technique that uses extrusion of the parent material along with heat, mechanical agitation, and/or pressure. Solvent bonding techniques, commonly used with other types of FML, can sometimes dissolve or degrade through chemical reaction with certain quality leachates thereby breaching the containment system.

Because the potential exists that the HDPE may be damaged in some way, a second HDPE liner has been designed for placement beneath the primary liner with a contingency collection system between the two liners. Without the second liner any breach in the primary would allow leachate to escape into the surrounding ground water. With the second liner protected by a 1-ft. thick drainage layer, the containment properties of the design can be maintained. The contingency collection system between the two liners can be (a) sampled periodically to detect potential problems and (b) pumped as a fluid collection and removal system to maintain environmental integrity.

A detailed description of conceptual landfill design is provided in Section 5.3, Impacts on Water Supplies.

As detailed in Subsection 5.3.5, Measurement Programs, a comprehensive ground water monitoring and sampling program will be initiated at the landfill site at least one year prior to beginning commercial operation. If contamination is detected the source of the leak will be determined and the liner will be repaired.

The leachate generated at the landfill would be expected to have an insignificant impact on water quality even if it did come in contact with the ground water reservoir. A detailed discussion of the matter is discussed in Subsection 5.3.4, Leachate and Runoff.

5.3.3 Drinking Water

The Biscayne Aquifer provides the sole source potable water supply for Broward County. The facility, landfill and appurtenances will not incorporate either direct withdrawal from or discharge to the Biscayne Aquifer as part of the design. All intake water, either for sanitary or boiler requirements, will be provided from City or County Utility Division water mains.

All discharges, from sanitary systems, boiler cooling tower blowdown, leachate, will be to an existing sanitary sewer line for ultimate disposal at the HWWTP.

Landfill design and drainage control considerations as described previously are such that there will be no expected impacts on the Biscayne Aquifer.

5.3.4 Leachate and Runoff

5.3.4.1 General

The proposed development is expected to have an insignificant impact on water quality. The materials to be landfilled (inert residue and unprocessable materials) will be essentially non-putrescible and non-combustible. The available data indicates that, typically, leachate generated at this type of landfill does not contain the pollutants usually associated with a processable waste landfill. Specifically, between 1977 and 1981, the environmental impact and potential utilization of incinerator residue was evaluated at the Suburban Experiment Station of the University of Massachusetts in cooperation with several Massachusetts environmental departments and the RESCO Saugus Incineration Facility. A summary report of this research effort is attached as Appendix 10.12.

The report describes the several studies designed to assess the direct and indirect interaction of incinerator residues with the natural environment. The three studies include wetland/incinerator residue interactions, extensive leaching studies of incinerator residue with natural rain, and horticultural studies in soil mixes containing incinerator residue.

The data indicate that land application of this heterogeneous material has had no discernible impact upon the quality of groundwater, the growth and diversity of the soil algal community, or the growth and diversity of the terrestrial higher plant community. Further, there has been no significant increase in heavy metal content of soils adjacent to large deposits of residue under field conditions.

Extensive leaching studies with natural rain revealed no significant losses of heavy metals from the residue in spite of a mean rainfall pH of 4.0. The residue had a high buffering capacity which persisted undiminished for over 3 years; during which time about 360,000 ml (60 inches) of pH 4.0 rainfall passed through the residue.

The testing indicated that under field conditions, the bare residue was readily colonized by native plant species, without the aid of any nutritional amendments. Three years after land application of the residue, the majority of the higher plants growing on the residue appeared vigorous and normal. As a result, the incinerator residue appears to be an excellent medium for growth of turf and horticulturally valuable plant materials such as bedding and pot plants like chrysanthemums, poinsettias, geraniums, and bulb plants. Mixtures containing RESCO residue, peat, and soil perform as well as commercial soil mixes and several soil-less potting media. Incinerator residue also is expected to perform well as a subsoil for building golf courses and as fill for grading highway slopes and median strips. After two years' contact with soil and cropping with a variety of plants, the residue takes on the character of a loose, granular soil-like material which drains well, is easy to work, and is quite resistant to erosion from wind or water. There is no difficulty growing a grass cover crop in the greenhouse or in the field on the residue surface.

The studies also show that incinerator bottom/fly ash mix is highly buffered; that the buffering capacity is massive and persistent; that heavy metals are chemically bound in the residue matrix, and that the residue can raise the pH of leaching acid rainwater from 4.0 - 7.8 without a concomitant release of heavy metals into the leachate. The data presented in this report suggest that incinerator residue (bottom/fly ash) might be used as a landfill intermediate and final cover and may improve landfill management by buffering acid rain percolating through the landfill, thereby reducing the leaching of heavy metals from the residue as well as from other metal-containing materials which might be present in the landfill.

Despite the evidence documenting the acceptable quality of residue leachate, the County is taking the additional precautions of providing an extensive liner and leachate collection systems, together with a stormwater control system that will minimize leachate and stormwater intermixing with surface and ground waters. The following sections summarize the stormwater and leachate control systems.

5.3.4.2 <u>Leachate Production</u>

The major source of leachate production is rainfall. This is the result of both natural phenomena and landfill operation procedures. As rainfall comes into contact with the surface of the landfill, a portion is diverted as runoff while the remaining volume penetrates the ash residue/unprocessable solid waste. Information has been provided by the DER on the landfiling and environmental acceptability of ash residue and is presented in Appendix 10.15. The extent of surface runoff is dependent upon many variables including surface vegetation, the magnitude and duration of the rainfall event, the character of the landfill surface at that time, and surface slopes. It should be noted that runoff which comes in contact with active landfill areas, i.e. areas without final cover, will be treated as leachate. Until the surface is raised to final elevation and capped, a relatively large volume of rainfall will infiltrate portions of the landfill. Upon final closure, infiltration will be minimized and stormwater runoff will remain uncontaminated.

To assess the potential volume of leachate generated at the residue/unprocessable waste landfill, various stages of landfill development were analyzed. The results of this water balance analysis indicate that during the May-October "wet" season, leachate production ranges from 0.5 to 8.3 million gallons/month, depending on the operation in progress.

5.3.4.3 Leachate Control

The landfill main cell will be developed in a series of subcells; each subcell will be temporarily bermed so that rainfall falling on the active side of the berm will be collected as leachate while rainfall falling on the inactive side of the berm will be collected as uncontaminated runoff (Figure 5.3.3). This substantially reduces the volume of leachate requiring treatment.

Before active landfilling begins in a landfill subcell a leachate collection system will be placed in the subgrade. The system consists of two layers of impermeable liner material (HDPE provides a permeability of 1 x 10^{-12} cm/sec), each with a collection system consisting of a series of pipes or filter fabric embedded in a porous subgrade and sloped so as to transport collected leachate via gravity to peripheral sumps. From the sumps the leachate is pumped to ultimate disposal at the HWWTP. The top liner and collection system is designed to transport all leachate generated at the landfill while the bottom system is provided to contain and transport leachate which may leak through the top system.

As major sections of the residue landfill are brought to final grade, portions of the final cap will be applied. The final cap serves the function of (a) covering and securing deposited wastes, (b) supporting an aesthetically pleasing stand of vegetation, and (c) impeding infiltration of rainwater into the waste to reduce leachate quantities to be handled.

Section 5.3, Impacts on Water Supplies, provides a more detailed description of the technology utilized to control leachate and runoff.

5.3.5 Measurement Programs

The recommended permanent long-term ground water monitoring network includes three upgradient well clusters (five wells per cluster) and several downgradient monitoring well clusters. In addition, the landfill contingency collection system will be pumped and monitored for leachate leak detection.

The proposed long-term ground water sampling program will involve quarterly sampling for a wide variety of inorganic and heavy metal constituents, as well as, a quality assurance/quality control program. The proposed long-term ground water sampling program will be updated as needed as changes in governmental regulation become applicable.

5.3.5.1 Recommended Permanent Long-Term Ground Water Monitoring Network

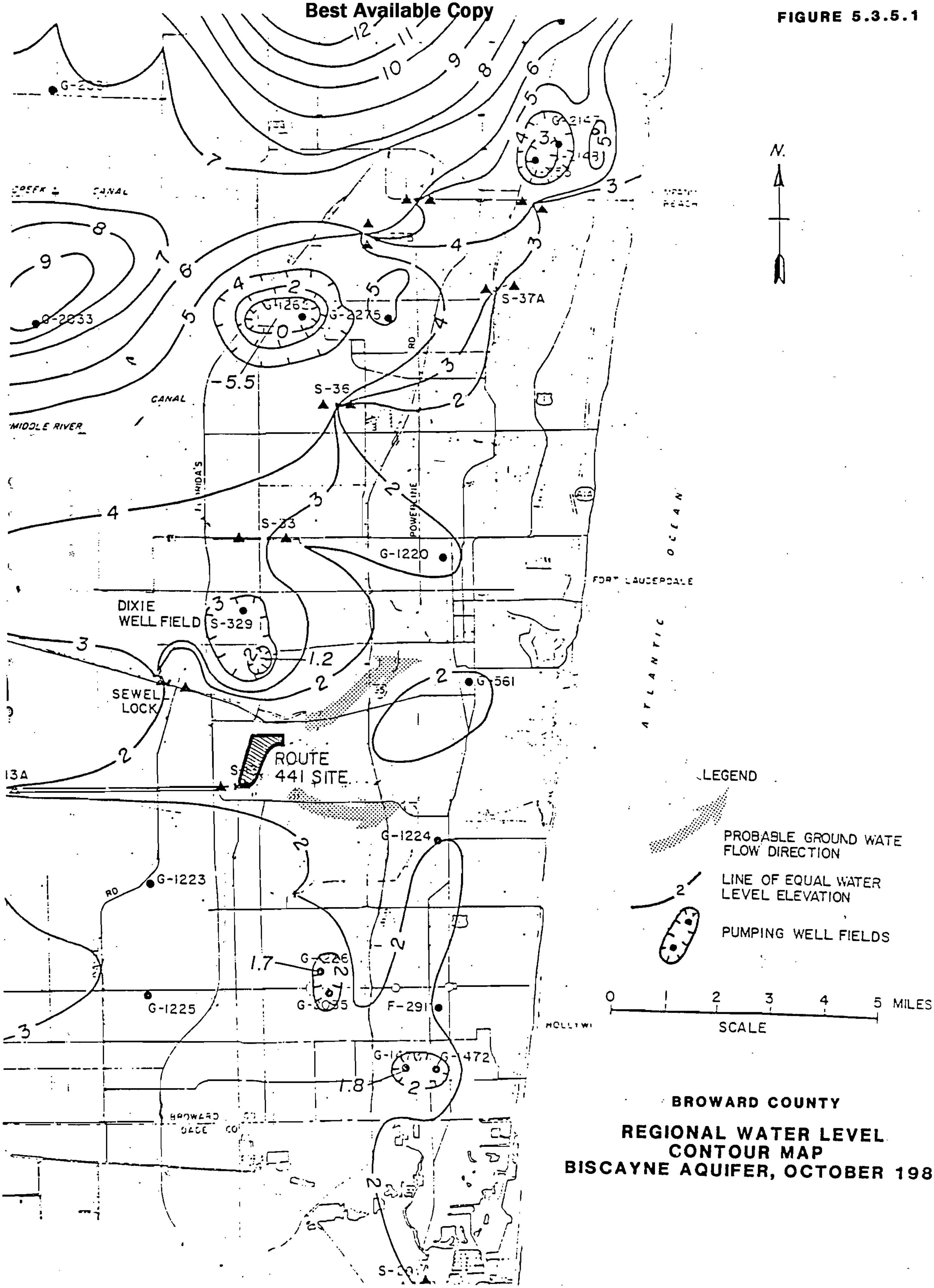
The basic factors which were taken into consideration in the development of a long-term monitoring system included:

- o Ground water flow conditions (shallow and deep).
- o Ground water quality conditions (principally location of fresh/brackish water interface).
- o Ground water use and the locations of major pumping centers (Section 2).
- o Landfill design - specifically use of a synthetic liners and use of a leachāte detection system. There will also be at least a ±5-foot separation from the water table).

The principal direction of ground water flow in the shallow regimen is to the east (see Figure 2.3.2.4 in Section 2.3.2, Subsurface Hydrology) and shallow flow ultimately discharges to the South New River Canal. Ground water flow conditions at depth become somewhat more complicated primarily due to large withdrawals north and west of the site.

Prior to extensive development of the Biscayne Aquifer, the principal direction of ground water flow was south-southeast. However, as shown on Figure 5.3.5.1, the extensive

FIGURE 5.3.5.1



BROWARD COUNTY

REGIONAL WATER LEVEL CONTOUR MAP BISCAYNE AQUIFER, OCTOBER 198[illegible]

development of this aquifer has altered natural flow conditions at places. The most recent water table contour map (Figure 5.3.5.1; USGS, 1983) and earlier contour maps indicate that ground water flow, in close proximity to the site, is in a general easterly direction. Moreover, while major pumping centers to the north and west have caused a cone of depression, the cone does not extend to the Route 441 Site.

Given the current understanding of both shallow and deep ground water flow conditions, it appears reasonable that downgradient monitoring take place along the eastern boundary of the site. However, given that increased pumpage might take place at nearby well fields north and west of the site, we would also recommend the placement of as many as three deep well clusters to monitor for possible future ground water movement to these well fields.

We have developed the elements of a monitoring system which are summarized below. It is important that the long-term monitoring effort at the site also address and monitor ground water flow conditions in order to assess possible changes in flow direction.

Shallow Network

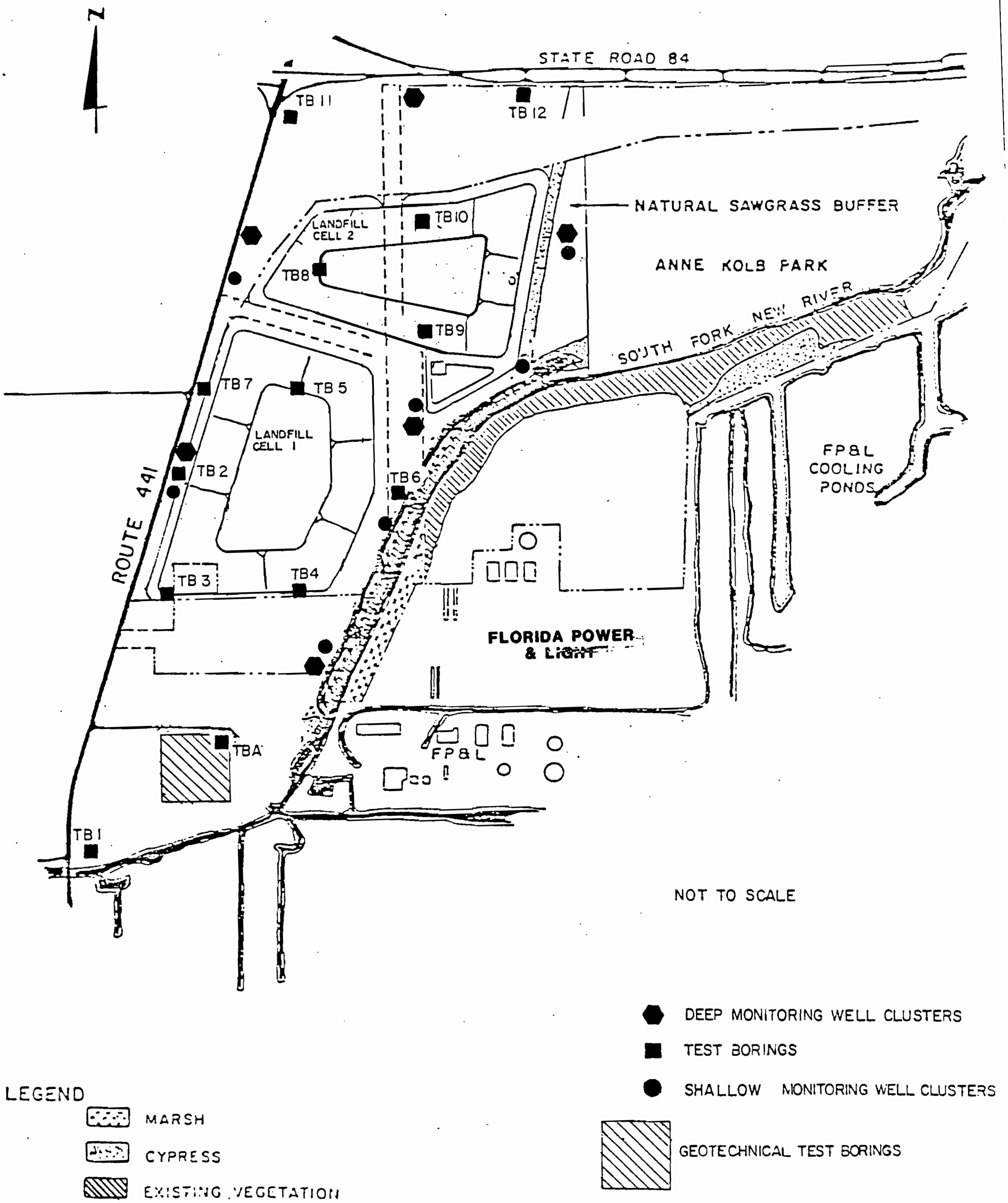
- Upgradient: Use existing clusters (Figure 5.3.5.2).

- Downgradient: Install five shallow clusters downgradient of the landfill cells as shown on Figure 5.3.5.2. The wells should be screened from 15 to 25 feet and from 40 to 50 feet.

Principal objective will be to assess downgradient ground water quality conditions prior to discharge to South New River Canal.

Medium/Deep Network

- Due to uncertainty with respect to future pumpage at well fields to the north and west of the site, it would seem reasonable to establish a medium and deep monitoring network between the landfill site and major pumping centers, as well as medium and deep downgradient monitoring well clusters.



RECOMMENDED LOCATIONS FOR PERMANENT MONITORING WELLS

Proposed clusters would include:

- Two clusters to the north between the site and Dixie Well Field.

- One cluster to the west between the site and Ferncrest Well Field.

- Three clusters to the east, downgradient of the landfill cells.

The proposed clusters would be comprised of 5 wells completed at depths of 25, 50, 75, 100 and 150 feet.

Leak Detection

As described in Section 5.3, Impacts on Water Supplies, the landfill is designed with a contingency collection system between the two liners. This collection system is supplied with a separate sump which will be sampled periodically to detect potential problems and pumped to maintain environmental integrity.

5.3.5.2 Proposed Long-Term Ground Water Sampling Program

Ground water sampling will begin on a quarterly basis upon completion of the deep monitoring well system. It is anticipated this will be at least one year prior to the beginning of commercial operation of the Resource Recovery Plant. Ground water sampling will be completed in accordance with procedures outlined in:

- Procedures Manual for Ground Water Monitoring at Solid Waste Disposal Facilities, EPA/530, SW-611, August 1977.

- National Handbook of Recommended Methods for Water-Data Acquisition, USGS, 1977-1983.

- Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WPCF, 1975.

Depending on well diameter, depth, and recharge rates, we propose the use of either hand bailers or sampling pumps to evacuate water from the wells. We recommend the removal of three to five well casing volumes from each well prior to sample collection.

At the end of the well evacuation procedure, temperature, pH and specific conductance should be measured and recorded. Field notes should be kept of water levels during and after the evacuation procedure, and also of pumping of bailing rates.

Ground water samples should be collected with dedicated PVC bailers. Samples should be sent to the laboratory, with appropriate labeling and chain-of-custody forms, at the end of each day.

We propose that the samples be analyzed for the constituents specified in Table 5.3.5.1. The proposed constituents (Table 5.3.5.1) include indicators of leachate generation from municipal landfills as well as common incinerator ash constituents. In addition, an annual pesticide scan will be included in the program.

A Quality Control (QC) program for laboratory services will be required to ensure confidence in the reported results. A QC program may also provide information pertaining to factors in the sampling procedures that may adversely bias the "true" definition of a specific chemical parameter.

We recommended that the Quality Control program be conducted on two levels, as follows:

- o The contracted laboratory should be required to perform a QC program as described in the U.S. EPA Handbook for Analytical Quality Control in Water and Wastewater Laboratories (EPA 600/2-79-019). The QC plan calls upon the laboratory to perform "duplicate" and "self-spiked" analyses of water samples over the course of the sampling program. The frequency of the duplicates and spikes are 1 from every 10 and 20 water samples collected form the field, respectively.

- o Duplicate and spiked samples, collected according to a similar schedule as described above, should be prepared by the sampling crew. These samples should never be identified as such, and thereby, serve as "unannounced spot checks" on laboratory performance.

TABLE 5.3.5.1

SAMPLING PARAMETERS

Constituent	Detection Limit
TOC	1 mg/l
COD	5 mg/l
pH	-
Specific Conductance	-
Nitrate-N	0.1 mg/l
Sulfate	5 mg/l
Chloride	5 mg/l
Sodium	1 mg/l
Potassium	1 mg/l
Magnesium	0.04 mg/l
Calcium	1 mg/l
Ammonium-N	0.1 mg/l
Bicarbonate	1 mg/l
Alkalinity	1 mg/l
Iron	0.05 mg/l
Manganese	0.05 mg/l

Priority Pollutant Metals	Detection Limit
Antimony	0.2 mg/l
Arsenic	0.01 mg/l
Beryllium	0.01 mg/l
Cadmium	0.01 mg/l
Chromium (total)	0.05 mg/l
Copper	0.05 mg/l
Cyanide	0.01 mg/l
Lead	0.01 mg/l
Mercury	0.01 mg/l
Nickel	0.05 mg/l
Selenium	0.01 mg/l
Silver	0.01 mg/l
Thallium	0.1 mg/l
Zinc	0.005 mg/l

Duplicate samples will consist of filling up two different sets of containers for water at a single sampling location. Spikes should be prepared with USEPA samples at a contractual laboratory in Florida.

5.3.5.3 Proposed Long-Term Surface Water Monitoring Program

The proposed surface water monitoring program will comply with water quality standards during the operation of the facility.

All stormwater run-off generated up to the 25 year - 72 hour design storm is to be captured on-site, temporarily stored and then slowly released via a filter berm bleeddown system into the adjacent marsh areas. Excess run-off is discharged via the outfall structure into the adjacent marsh area.

No data has been generated to confirm the water quality of the stormwater run-off expected from the proposed residue/unprocessable landfill. All rainfall falling on the working face of the landfill will be collected and handled separately as leachate. Temporary dikes and drainage works will divert uncontaminated run-off from entering the working landfill face. The finished sides and exterior of the landfill will be constructed of two (2) feet of soil and then grassed. Potential contaminants are as follows:

- o <u>Nutrients</u> - used to fertilize the grassed slopes and swales.
- o <u>Sediments</u> - washed off the side slopes.

Nutrient levels in the run-off will be monitored. If excess levels are reported then Broward County would take steps to insure that the fertilizer application rates are lowered or the type of fertilizer chemical change. A retention pond is prvoided ahead of the outfall structure which will reduce velocities and allow soil particles, etc. an opportunity to settle out. When the stormwater run-off passes through the outfall structure, it is once again slowed down in the energy dispersion pond and then allowed to flow overland through the marsh prior to discharging into the river.

An extension surface water quality monitoring program, similar to that described in Section 2.3.4.2, Measurement Programs, will be undertaken in the C-11 Canal during the first 10 years of operation. With 10 years of water quality data available, a reevaluation of the proposed stormwater disposal system may be required. Pretreatment of runoff before disposal may be necessary.

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 resource recovery facility will be handled in a safe, controlled manner from the point of generation to the point of disposal at the adjacent landfill. Details regarding protection of ground and surface waters at and adjacent to the landfill are presented in Section 4.2, Impact on Surface Water Bodies and Uses, Section 4.3, Groundwater Impacts, and Section 5.3, Impacts on Water Supplies. The latter section includes a description of the method by which the landfill will be operated on a daily basis, including measures for the prevention of erosion, leachate collection and treatment, and the minimization of visual impact. Details regarding the long-term management of the landfill, including final grading and landscaping, vertical elevation, and finished contour elevation are also presented in Section 5.3.

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 residue 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 HWWTP. Therefore, there will be no expected effects of these discharges on off-site water supplies.

5.6 Air Quality Impacts

5.6.1 Impact Assessment

Predicted maximum impact concentrations for the proposed facility at initial projected opertion, using screening and refined modeling receptor grids, are presented in Tables 5.6.1.1 and 5.6.1.2, respectively, and at maximum projected operation in Tables 5.6.1.3 and 5.6.1.4, respectively. These results are based on the plant charging 2,352 tpd or 98.0 tons per hour of solid waste at initial projected operation and 3,795 tpd or 158.1 tons per hour of solid waste at maximum projected operation. Figures 5.6.1.1 and 5.6.1.2 present impact concentration for criteria pollutants (these for which Federal Ambient Air Quality Standards have been established) graphically by comparing the maximum short-term impact levels with monitored background value and the applicable standards.

In general, maximum pollutant concentrations increased slightly for the plant at maximum projected operation compared to initial operation and for the refined receptor grid compared to the screening grid. For most of the pollutants, the predicted maximum concentrations are below the Prevention of Significant Deterioration (PSD) significant impact levels and

TABLE 5.6.1.1

PREDICTED MAXIMUM CONCENTRATIONS FOR THE PROPOSED BCRR FACILITY AT INITIAL PROJECTED OPERATION (115 PERCENT OF NAMEPLATE CAPACITY) USING SCREENING MODELING METHODS

Pollutant	Averaging Time	Maximum Concentration* (ug/m^3)	Receptor Location† Direction (°)	Receptor Location† Distance (km)	Period Year	Period Julian Day	Period Ending
SO_2	3-hour	23.8	300	2.7	1971	126	12
	24-hour	5.4	310	2.3	1972	112	24
	Annual	0.6	280	4.3	1970	-	-
			300	3.1	1972,1974	-	-
TSP	24-hour	0.74	310	2.3	1972	112	24
	Annual	0.08	280	4.3	1970	-	-
			300	3.1	1972,1974	-	-
NO_2	Annual	0.62	280	4.3	1970	-	-
			300	3.1	1972,1974	-	-
CO	1-hour	9.7	10	1.1	1970	187	11
	8-hour	2.4	310	2.3	1972	111	16
Pb	24-hour	0.30	310	2.3	1972	112	24
	(Quarterly)	(0.03)**	(300)	(3.5)	(1972)	(-)	(-)
			(300)	(3.9)	(1974)	(-)	(-)
F	24-hour	0.25	310	2.3	1972	112	24
Be	24-hour	0.0000091	310	2.3	1972	112	24
Hg	24-hour	0.0026	310	2.3	1972	112	24

*Highest, second-highest concentrations for short-term period; highest concentration for annual period. Values in parenthesis represent results associated with revised *de minimis* monitoring levels. See Section 2.2 for details.

†With respect to proposed facility.

**Annual average.

Source: ESE, 1985.

MALCOLM PIRNIE

TABLE 5.6.1.2

PREDICTED MAXIMUM CONCENTRATIONS FOR THE PROPOSED BCRR FACILITY AT INITIAL PROJECTED OPERATION (115 PERCENT OF NAMEPLATE CAPACITY) USING REFINED MODELING METHODS

Pollutant	Averaging Time	Maximum* Concentration (ug/m^3)	Receptor Location† Direction (°)	Receptor Location† Distance (km)	Period Year	Period Julian Day	Period Hour Ending	Significant Impact Level (ug/m^3)	*De Minimis* Monitoring Level (ug/m^3)
SO_2	3-hour	23.8	300	2.7	1971	126	12	25	NA
	24-hour	5.5	312	2.4	1973	112	24	5	13
	Annual	0.6	280	4.3	1970	-	1	1	NA
			300	3.1	1972,74				
TSP	24-hour	0.75	312	2.4	1972	112	24	5	10
			270		1973	107	24		
	Annual	0.08	280	4.3	1970	-	-	1	NA
			300	3.1	1972,74	-	-	-	-
				3.1	1972,74	-	-	-	-
NO_2	Annual	0.6	280	4.3	1970	-	-	1	14
			300	3.1	1972,74	-	-	-	-
CO	1-hour	10.4	8	1.0	1970	187	11	2,000	NA
	8-hour	2.7	312	2.3	1972	111	16	500	575
Pb	24-hour	0.30	312	2.4	1972	112	24	NA	0.1
	(Quarterly)	(0.03)**	(280)	(4.3)	(1970)	-	-	(NA)	(0.1)
			(300)	(3.1)	(1972,74)	-	-		
F^-	24-hour	0.25	312	2.4	1972	112	24	NA	0.25
Be	24-hour	0.000093	312	2.4	1972	112	24	NA	0.0005 (0.001)
Hg	24-hour	0.0026	312	2.4	1972	112	24	NA	0.25

NA = Not Applicable.

*Highest, second-highest concentration for short-term period; highest concentration for annual period. Values in parantheses represent results associated with revised *de minimis* monitoring levels. See Section 2.2 for details.

†With respect to proposed facility.

**Annual average.

Source: ESE, 1985.

TABLE 5.6.1.3

PREDICTED MAXIMUM CONCENTRATIONS FOR THE PROPOSED BCRR FACILITY AT MAXIMUM PROJECTED OPERATION (115 PERCENT OF NAMEPLATE CAPACITY) USING SCREENING MODELING METHODS

Pollutant	Averaging Time	Maximum Concentration* (ug/m^3)	Receptor Location† Direction (°)	Receptor Location† Distance (km)	Period Year	Period Julian Day	Period Ending
SO_2	3-hour	27.5	10	1.1	1970	187	12
	24-hour	5.8	310	2.7	1972	111	24
	Annual	0.6	300	3.5	1972	-	-
			300	3.9	1974	-	-
TSP	24-hour	0.79	310	2.7	1972	111	24
	Annual	0.08	300	3.5	1972	-	-
			300	3.9	1974	-	-
NO_2	Annual	0.6	300	3.5	1972	-	-
			300	3.9	1974	-	-
CO	1-hour	13.5	10	1.1	1970	187	11
	8-hour	2.6	310	2.7	1972	183	16
Pb	24-hour	0.32	310	2.7	1972	111	24
	(Quarterly)	(0.03)**	(300)	(3.5)	(1972)	(-)	(-)
			(300)	(3.9)	(1974)	(-)	(-)
F	24-hour	0.27	310	2.7	1972	111	24
Be	24-hour	0.0000098	310	2.7	1972	112	24
Hg	24-hour	0.0028	310	2.7	1972	112	24

*Highest, second-highest concentrations for short-term period; highest concentration for annual period. Values in parenthesis represent results associated with revised <u>de minimis</u> monitoring levels. See Section 2.2 for details.

†With respect to proposed facility.

**Annual average.

Source: ESE, 1985.

TABLE 5.6.1.4

PREDICTED MAXIMUM CONCENTRATIONS FOR THE PROPOSED BCRR FACILITY AT MAXIMUM PROJECTED OPERATION (115 PERCENT OF NAMEPLATE CAPACITY) USING REFINED MODELING METHODS

Pollutant	Averaging Time	Maximum* Concentration (ug/m^3)	Receptor Location† Direction (°)	Receptor Location† Distance (km)	Period Year	Period Julian Day	Period Hour Ending	Significant Impact Level (ug/m^3)	*De Minimis* Monitoring Level (ug/m^3)
SO_2	3-hour	29.1	8	1.0	1970	187	12	25	NA
	24-hour	5.9	312	2.8	1972	112	24	5	13
	Annual	0.6	300	3.5	1972	-	1	NA	-
TSP	24-hour	0.81	312	2.8	1972	112	24	5	10
	Annual	0.08	300	3.5	1972	-	-	1	NA
			300	3.9	1974	-	-	-	-
NO_2	Annual	0.6	300	3.5	1972	-	-	-	-
			300	3.9	1974	-	-	-	-
CO	1-hour	14.3	8	1.0	1970	187	11	2,000	NA
	8-hour	2.6	308	2.7	1972	183	16	500	575
Pb	24-hour	0.32	312	2.8	1972	112	54	NA	0.1
	(Quarterly)	(0.03)**	(300)	(3.5)	1972	-	-	(NA)	(0.1)
			(300)	(3.9)	1974	-	-		
F^-	24-hour	0.27	312	2.8	1972	112	24	NA	0.25
Be	24-hour	0.000010	312	2.8	1972	112	24	NA	0.0005 (0.001)
Hg	24-hour	0.0028	312	2.8	1972	112	24	NA	0.25

NA = Not Applicable.

*Highest, second-highest concentration for short-term period; highest concentration for annual period. Values in parantheses represent results associated with revised *de minimis* monitoring levels. See Section 2.2 for details.

†With respect to proposed facility.

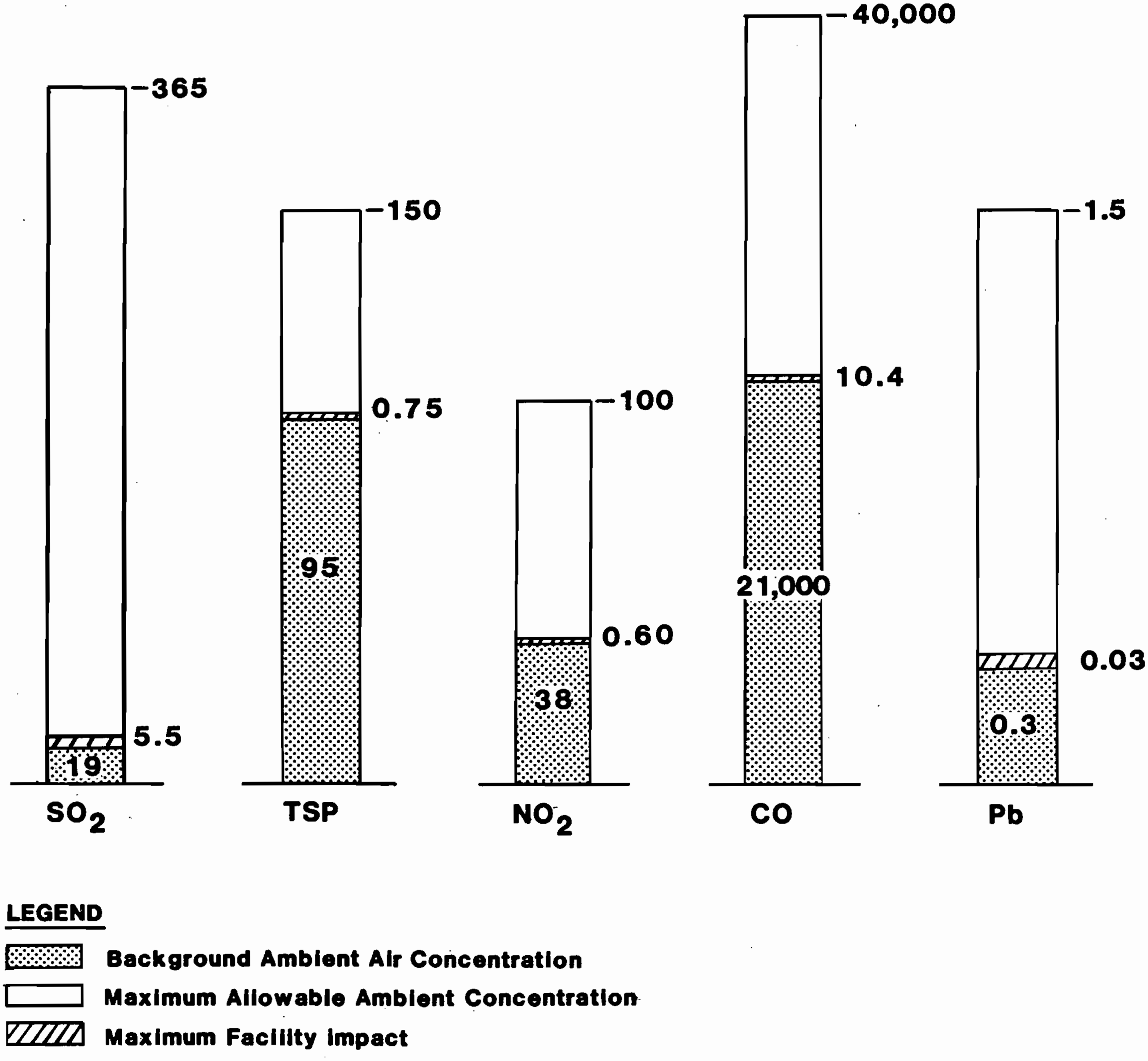
**Annual average.

Source: ESE, 1985.

COMPARISON OF FACILITY AIR QUALITY IMPACTS WITH SHORT-TERM AAQS* AVERAGING PERIODS

INTIAL PROJECTED CAPACITY

(Concentrations in ug/m^3**)

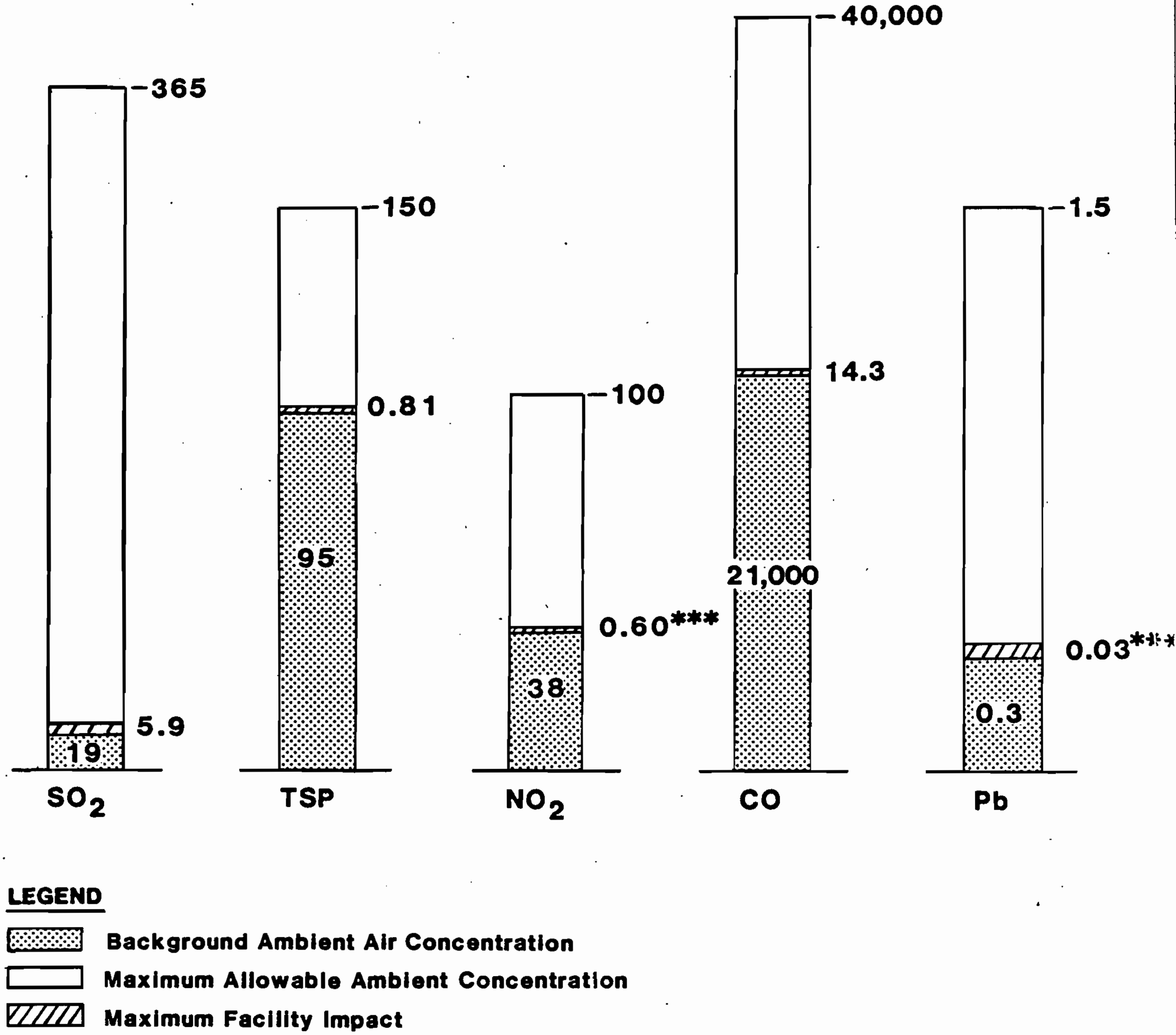


SO_2 - Sulfur Dioxide (SO_2) concentrations given for 24-hour averaging time.
TSP - Particulate Suspended Matter (TSP) concentrations given for 24-hour averaging time.
NO_2 - Nitrogen Dioxide (NO_2) concentrations given for annual averaging time.
CO - Carbon Monoxide (CO) concentrations given for 1-hour averaging time.
Pb - Lead (Pb) concentrations given for quarterly averaging time.
* - AAQS - Ambient Air Quality Standard
** - ug/m^3 - micrograms per cubic meter

COMPARISON OF FACILITY AIR QUALITY IMPACTS WITH SHORT-TERM AAQS* AVERAGING PERIODS

MAXIMUM PROJECTED CAPACITY

(Concentrations in ug/m3**)



SO_2 - Sulfur Dioxide (SO_2) concentrations given for 24-hour averaging time.
TSP - Particulate Suspended Matter (TSP) concentrations given for 24-hour averaging time.
NO_2 - Nitrogen Dioxide (NO_2) concentrations given for annual averaging time.
CO - Carbon Monoxide (CO) concentrations given for 1-hour averaging time.
Pb - Lead (Pb) concentrations given for quarterly averaging time.
* - AAQS - Ambient Air Quality Standard
** - ug/m^3 - micrograms per cubic meter
*** Actual concentrations are negligably higher (rounded to the nearest hundredth)

de minimis monitoring levels. As a result, the proposed plant 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 predicted 3- and 24-hour concentrations for the plant operations are greater than the significant impact levels. However, even under maximum projected operation, the maximum concentrations are predicted to be only 16 and 18 percent above the 3- and 24-hour significant impact levels, respectively. 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 proposed plant are expected to comply with the national and Florida AAQS and PSD Class II increments. Appendix 10.16 is a report prepared by Fred C. Hart Associates, Inc. Report to New York City Department of Sanitation on projected emissions from similar resource recovery facilities. Additionally, testimony by Gary Smith, EPA on behalf of William Ruck Lehaus (then Director, EPA) indicating the environmental acceptability of emissions from resource recovery incinerators is contained in Appendix 10.17.

The proposed emissions from the proposed facility produce predicted maximum concentrations that are less than PSD significant impact levels and de minimis monitoring levels in the PSD Class I area in the Everglades National Park (Tables 5.6.1.5 and 5.6.1.6). These results are consistent with the predicted maximum concentrations within the near vicinity of the proposed facility. Thus, the emissions for proposed facility are expected to comply with national and Florida Ambient Air Quality Standards (AAQS) and PSD Class I increments in the Everglades National Park.

TABLE 5.6.1.5

PREDICTED MAXIMUM CONCENTRATIONS AT THE PSD CLASS I AREA DUE TO THE PROPOSED BCRR FACILITY AT INITIAL PROJECTED LOAD (115 PERCENT OF NAMEPLATE CAPACITY)

Pollutant	Averaging Time	Class I PSD Increment	Maximum Concentration* (ug/m^3)	Receptor Location UIM Cordinates (km) x	y	Period Year	Julian Day	Hour Ending	Significant Impact Level (ug/m^3)	Monitoring Level (ug/m^3)
SO_2	3-hour	25	4.0	520.75	2849.4	1973	18	3	25	NA
	24-hour	5	0.8	522.75	2849.4	1973	17	24	5	13
	Annual	2	0.1	-	0	1971-74	-	-	1	NA
TSP	24-hour	10	0.10	522.75	2849.4	1973	17	24	5	10
	Annual	5	0.01	-	-	1971-74	-	-	1	NA
NO_2	Annual		0.1	-	-	1971-74	-	-	1	14
CO	1-hour		1.4	532.75	2847.4	1971	216	20	2,000	NA
	8-hour		0.31	522.75	2849.4	1971	204	24	500	575
Pb	24-hour (Quarterly)		0.042 (0.0)†	522.75	2849.4	1973	17	24	NA	0.1 (0.1)
F^-	24-hour		0.035	522.75	2849.4	1973	17	24	NA	0.25
Be	24-hour		0.0000013	522.75	2849.4	1973	17	24	NA	0.0005 (0.001)
Hg	24-hour		0.00036	522.75	2849.4	1973	17	24	NA	0.25

NA = Not applicable.
*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.
Source: ESE, 1985.

TABLE 5.6.1.6

PREDICTED MAXIMUM CONCENTRATIONS AT THE PSD CLASS I AREA DUE TO THE PROPOSED BCRR FACILITY AT MAXIMUM PROJECTED LOAD (115 PERCENT OF NAMEPLATE CAPACITY)

Pollutant	Averaging Time	Maximum Concentration* (ug/m^3)	Receptor Location UIM Cordinates (km) x	y	Period Year	Julian Day	Hour Ending	Significant Impact Level (ug/m^3)	Monitoring Level (ug/m^3)
SO_2	3-hour	4.8	520.75	2849.4	1973	194	21	25	NA
	24-hour	1.0	522.75	2849.4	1973	60	24	5	13
	Annual	0.1	-	0	1971-74	-	-	1	NA
TSP	24-hour	0.13	522.75	2849.4	1973	60		5	10
	Annual	0.01	-	-	1971-74	-	-	1	NA
NO_2	Annual	0.1	-	-	1971-74	-	-	1	14
CO	1-hour	1.7	532.75	2847.4	1971	216	20	2,000	NA
	8-hour	0.38	522.75	2849.4	1971	204	24	500	575
Pb	24-hour (Quarterly)	0.054 (0.0)†	522.75	2849.4	1974	60	24	NA	0.1 (0.1)
F^-	24-hour	0.045	522.75	2849.4	1974	60	24	NA	0.25
Be	24-hour	0.0000016	522.75	2849.4	1974	60	24	NA	0.0005 (0.001)
Hg	24-hour	0.00045	522.75	2849.4	1974	60	24	NA	0.25

NA = Not applicable.
*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.
Source: ESE, 1985.

Because the maximum predicted concentrations for pollutants emitted above the PSD significant emissions levels are below the AAQS and theshold limits the cause injury to vegetation and soils (see Appendix 10.1.5), the impacts due to each facility are not expected to have a significant impact on vegetation and soils in the PSD Class I and II areas. Also, the emission are highly unlikely to cause adverse visibility impairment in the Everglades National Park.

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 (see Table 2.3.8.1).

From the analysis presented in Appendix 10.10, the projected noise levels at sensitive boundaries range from 55-65 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 point of origin to all property lines around the perimeter of the site. 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 recorded at the property lines 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. Mitigation measures presently being considered include:

- o On the west side of the site, there will be a 200 foot setback east of Route 441. The setback will be enriched with extensive landscaping which will include high trees and other flora.

TABLE 5.7.1

PROJECTED NOISE IMPACTS (dB(A))

Noise Source	Noise Level 50' from Source	Distance to Closest Property Line	Zoning Classification Impacted	Noise Attenuation[1]	Noise Level at Property Line[2]	Noise Standard[3]
Trucks at Landfill	80	300°, west	industrial	15	65	70
Trucks at Facility	80	300-400', south	industrial, agricultural	15	65	70(+10)
Evaporative Cooling Tower[5]	-	300-400', south	residential	-	approx. 55 dB	55(+10)[4]

1. Attenuation is by distance (see Section 3.4) for trucks. For cooling tower, attenuation is by distance and a noise attenuating barrier.

2. Noise level at source - noise attenuation.

3. Sound Level Limit (+ allowable increment), from Chapter 27-7 of the Broward County Code of Regulations (see Section 4.2).

4. Standards require that levels measured at residential areas cannot exceed 55 dB(A) for more than 50% of any measurement period. It is predicted that trucks noises above 55 dB(A) will not occur for more than 50% of any measurement period. Further, regulations state that a sound level limit of 65 dB(A) may not be exceeded during the hours of 7 a.m. to 10 p.m.

5. Figures extrapolated from Pinellas County facility data. Noise reading at Pinellas County, 200 feet from the noise source, was 65 dB(A). Attenuation is expected to be achieved by distance and by noise attenuating barriers and surrounding structures.

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. Auto Horn, 3 Ft.	Discotheque	120	Maximum Vocal Effort	
		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	

BROWARD COUNTY

COMMON NOISE LEVELS

- On site noise generated from plant processing operations will be either largely contained within the structure or shielded from residential properties.

- The air cooled condenser will be surrounded by a noise-attenuating wall/barrier. In addition, noise resulting from its operation will be shielded by locating it on the east side of the facility. The facility will then act as a sound barrier between the tower and residential areas located to the west.

The operation of the proposed facility will increase day time truck traffic levels along roadways in the vicinity of the site. Truck traffic to and from the facility will occur an estimated twelve hours per day from approximately 7:00 AM to 7:00 PM.

The average hourly track volume expected to be added to the access roads from the proposed project is 25 vehicle trips for the initial maximum installed capacity of 2,352 tons per day and 35 vehicle trips for the ultimate capacity of approximately 3,300 tons per day. These figures represent less than a one percent increase above existing traffic patterns and therefore, would not have a significant impact on ambient noise levels during the period when trucks would be entering and existing the facility. Trucks operating on a public right-of-way are exempted from noise control provisions (Section 4.2, Appendix 10.10).

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

There are no significant environmental effects resulting from plant operations that have not been discussed in Section 5.1 through 5.8.

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 increase these additional trips represent is presented. As the figures on Table 5.9.1 indicate, any increase in average daily traffic volumes will have an insignificant impact on existing traffic conditions. In addition, since both the resource recovery facility and the unprocessable ash/residue landfill will be located on the same site, there will be no need to haul ash residue over public roads, thus eliminating traffic and environmental impacts associated with the hauling of ash residue.

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

TABLE 5.9.1

BROWARD COUNTY RESOURCE RECOVERY FACILITY
ROUTE 441 SITE

PROJECTED TRAFFIC IMPACTS

	Segment Number	Average Daily Traffic	Approximate Additional Vehicle Trips	Percent Increase
Rt. 441 (south to Rt. 84)	562 (84 to Riverland)	35,930	36	0.1
	561 Riverland to SW 18th)	34,227	34	0.1
	560 (SW 18th to Davie)	35,524	24	0.1
Rt. 441 (north to Rt. 84)	626 (84 to Oaks)	29,596	100	0.3
	627 (Oaks to Orange)	30,059	168	0.6
	628 (Orange to Griffin)	26,174	131	0.5
Rt. 84 (east to Rt. 441)	593	37,480	7	<0.1
	592	44,399	7	<0.1
Rt. 84 (west to Rt. 441)	594	41,200	58	0.1
	595	44,920	50	0.1
Florida Turnpike Exit (east to Rt. 441)	629	11,678	7	0.1
	630	13,534	7	0.1

sites listed or eligible for listing, in the National Register of Historic Places (see Appendix 10.18).

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 south Broward County resource recovery project.

Some significant financial commitments already have been made to the project. Approximately $29 million has already been spent on acquisition of the site and another $5 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 Copans Road resource recovery projects. The southern Route 441 facility will serve approximately 60 percent of Broward County residents. Again, 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, 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

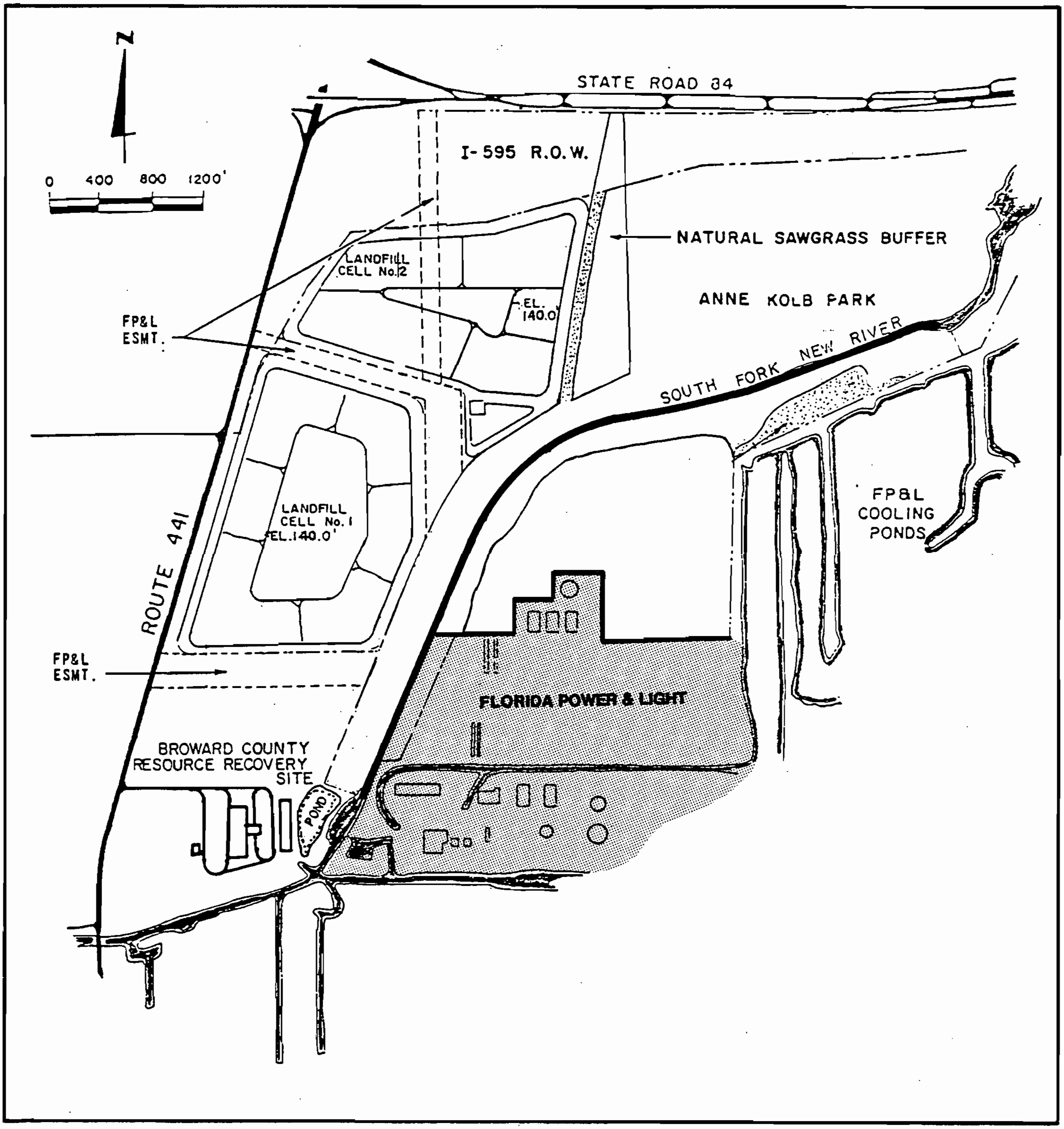
Based upon discussions with Florida Power and Light, Company (FP&L) officials and their preliminary investigation of electrical interconnection requirements, there does not appear to be a need for new transmission line corridors or any other long narrow siting corridors (e.g., rail lines, influent or effluent pipelines, etc.) which leave the main site area. The site is directly adjacent to the FP&L complex; however, the two sites are separated by the South Fork New River which runs along their entire length. Therefore, transmission lines will not cross any land that is not the property of the County or FP&L. The method for transmission line crossing of the South Fork New River will be designed such that it will have no adverse impact on existing use of the river nor will it affect current water conditions.

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.

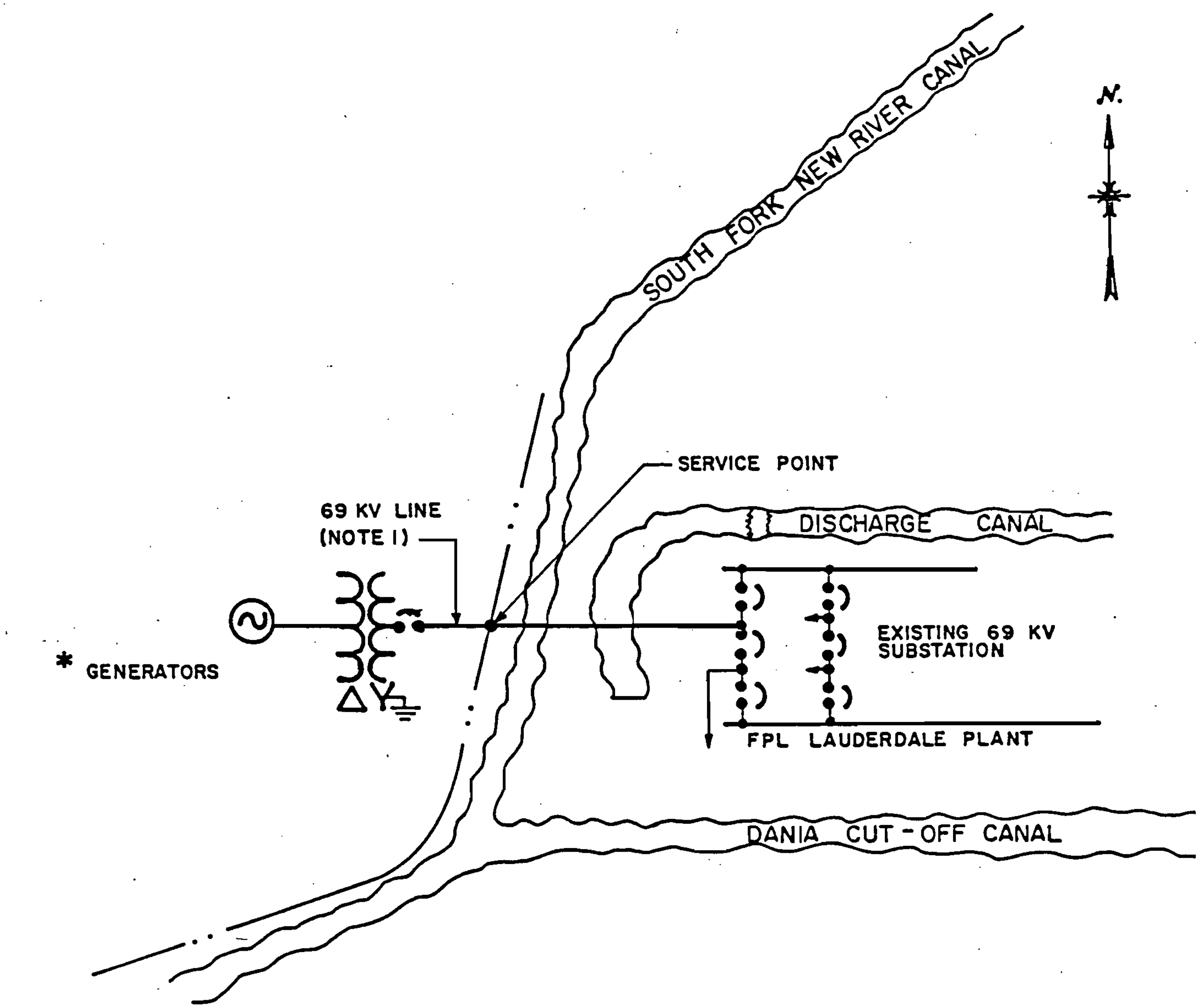
6.1 Electrical Power

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 69 KV transmission line will be extended westward



BROWARD COUNTY

RESOURCE RECOVERY SITE AND UTILITY LOCATIONS



* GROSS OUTPUT MAY BE SUPPLIED BY TWO GENERATORS

NOTE 1

PROVIDE FOR FUTURE CONVERSION FROM 69 TO 138 KV

BROWARD COUNTY

RESOURCE RECOVERY

ELECTRICAL INTERCONNECTION SCHEMATIC

ROUTE 441 SITE

across the South Fork New River Canal from FP&L's Fort Lauderdale Power Plant Substation to the facility substation. The routing of this line will require coordination in the development of the resource recovery plant. The facilities at the site will be designed to accommodate future conversion of the 69 KV service voltage to 138 KV.

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.

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 each facility's electric systems.

The distribution systems will have 4.16 KV and 400 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 $300,000 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.
- o Metering costs.
- o Suitable arrangements for termination of FP&L lines. The service points may be adjusted if desirable to provide suitable line terminations.
- o 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

The majority of benefits resulting from the construction and operation of the resource recovery facility are more qualitative than quantitative. Comparison with measurable costs is difficult to assess. This section, however, illustrates that the measurable costs associated with the proposed facility development should have a minimal impact on the facility users, and the associated benefits far outweigh any additional costs.

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 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

The Broward County Office of Budget and Management Policy has estimated that between $1.85 and $2.17 million in local tax revenues will be generated by the South Broward County Resource Recovery Project, Inc. based on Fiscal Year 1985 millage rates from the 1984 tax roll. Taxing authorities benefitting from this Project include Broward County, the Unincorporated Municipal Service District, Broward County School Board, South Florida Water Management District, South Broward Hospital District, South 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. Proposals submitted by potential vendors 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. More than 500 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 125 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 Recreation and Wetland Habitat Enhancement Benefits

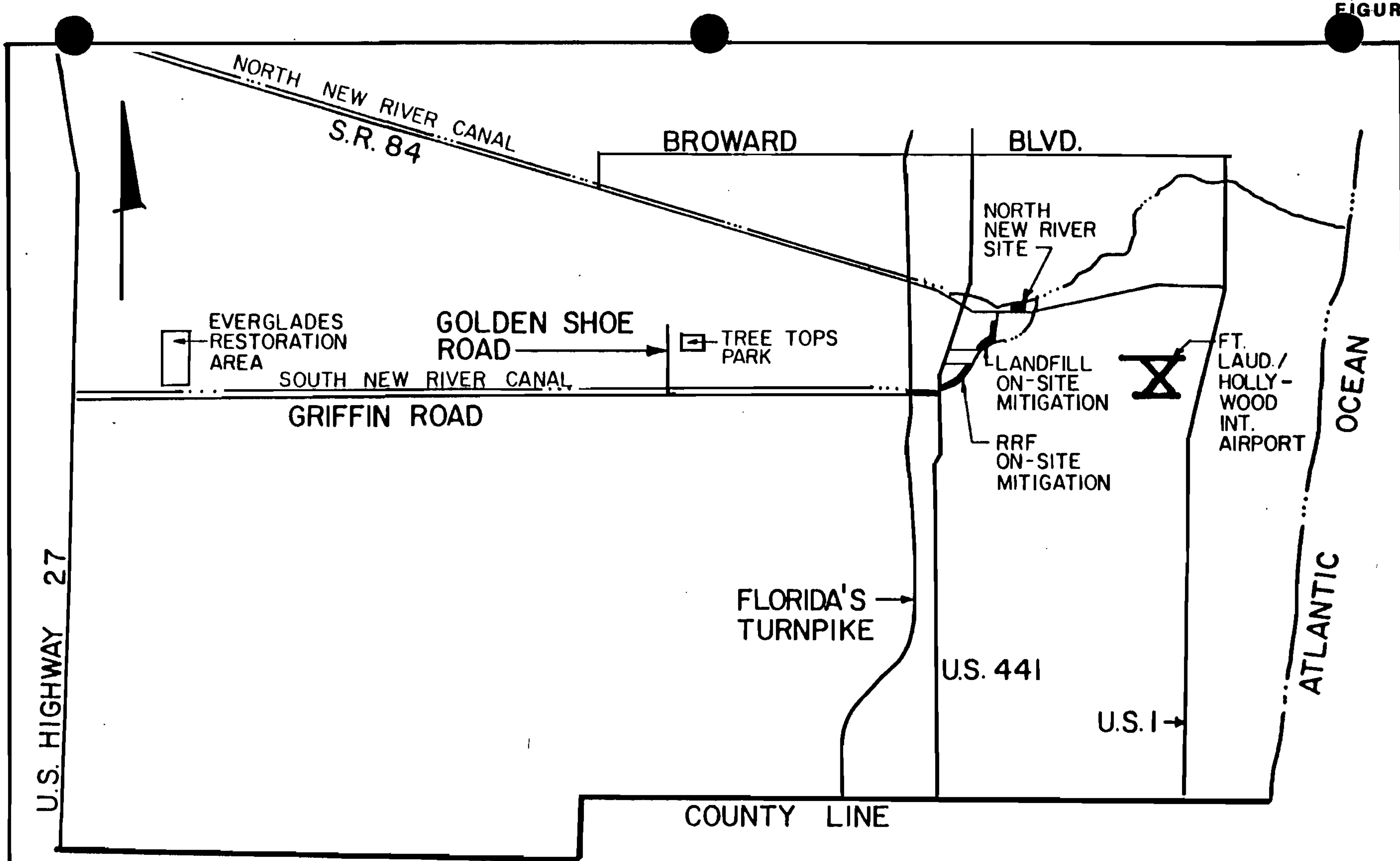
Development of the South Broward County Resource Recovery Project site will require that approximately 148 acres of wetland area be removed and filled. To compensate for the wetland losses, a mitigation plan involving 153 acres has been developed by the County as an integral part of the development (Appendix 10.1.4). The plan has been approved by biologists from the U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, Florida Game and Freshwater Fish Commission, Florida Department of Environmental Regulation, South Florida Water Management District and the Broward County Office of Planning.

Mitigation for the project (Figure 7.1.3.1) comprises the following parcels:

- 15 acres on site at the Resource Recovery Facility
- 33 acres on site at the Residue/Unprocessable Waste Landfill
- 16 acres adjacent to North Fork New River
- 15 acres at Tree Tops Park and
- 74 acres in the Everglades Restoration Area

Land acquisition costs for mitigation are summarized as follows:

FIGURE 7.1.3.1



MITIGATION SUMMARY

RESOURCE RECOVERY FACILITY (ON-SITE)	15 acres
LANDFILL (ON-SITE)	33 acres
NORTH NEW RIVER CANAL	16 acres
TREE TOPS PARK	15 acres
EVERGLADES RESTORATION AREA	74 acres

0 1 2 3 4 5

SCALE IN MILES

MITIGATION AREA
VICINITY MAP

LAND COSTS FOR PROJECT MITIGATION

Area	Acres	Costs/Acre
On Site	48	$ 100,000+
North New River	16	75,000
Tree Tops Park	15	None-Already in County Ownership
Everglades Restoration Area	74	12,000
Approximate Land Acquisition Cost		$6,888,000+

Land acquired for mitigation will be preserved in perpetuity for the citizens of Broward County through covenants and deed restrictions on the land which will bind the County, its successors and assigns and require that the land be maintained according to the requirements imposed by the regulatory agencies (See Appendix 10.1.4).

Mitigation work on the project site would be completed prior to the commencement of any landfill operation on the property or prior to the issuance of the Certificate of Occupancy for the resource recovery facility, whichever shall occur first.

The benefits realized as a result of the improved mitigation plan include the following:

- One-to-one replacement of wetlands lost;
- Wetlands of greater overall value per unit area than those lost to development;
- Compliance with regulatory agency requirements;
- Consistency with the County's Parks and Recreation Division Master Plan; and
- Provides beneficial environmental, social and recreational values to the people, wildlife and water resources of Broward County.

A more detailed discussion of the South Broward County Resource Recovery Project Mitigation Plan has been provided in Section 3 and Appendix 10.7.

7.1.4 Local Road Improvements

Construction of the South Broward County Resource Recovery Facility will occur at approximately the same time construction is undertaken for Interstate 595 (I-595). The County has been coordinating land acquisition and road improvement activities with the Florida Department of Transportation (FDOT). For example, the County will be dedicating 50 feet of right-of-way along the east side of U.S. Route 441 to FDOT as a part of I-595 related construction. In exchange, FDOT will provide the County with a southbound left turn lane, a median opening and north bound acceleration and deceleration lane on U.S. Route 441 at the entrance to the resource recovery facility. These improvements are subject to approval by Broward County Traffic Engineering and Engineering Divisions.

7.1.5 Environmental Benefits

The primary benefit associated with the development of a resource recovery facility in Broward County is the efficiency and effectiveness of the process itself, and its ability to provide an environmentally secure method of solid waste disposal.

The facility proposed for southern Broward County will have an initial maximum installed nameplate capacity to process approximately 860,000 tons per year of solid waste. However, it is estimated that approximately 730,000 tons per year of solid waste will actually be processed in efficient, proven waterwall boilers. 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 proposed resource recovery facility for Broward County will include an ash residue/unprocessable waste landfill adjacent to the waste-to-energy facility.

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.

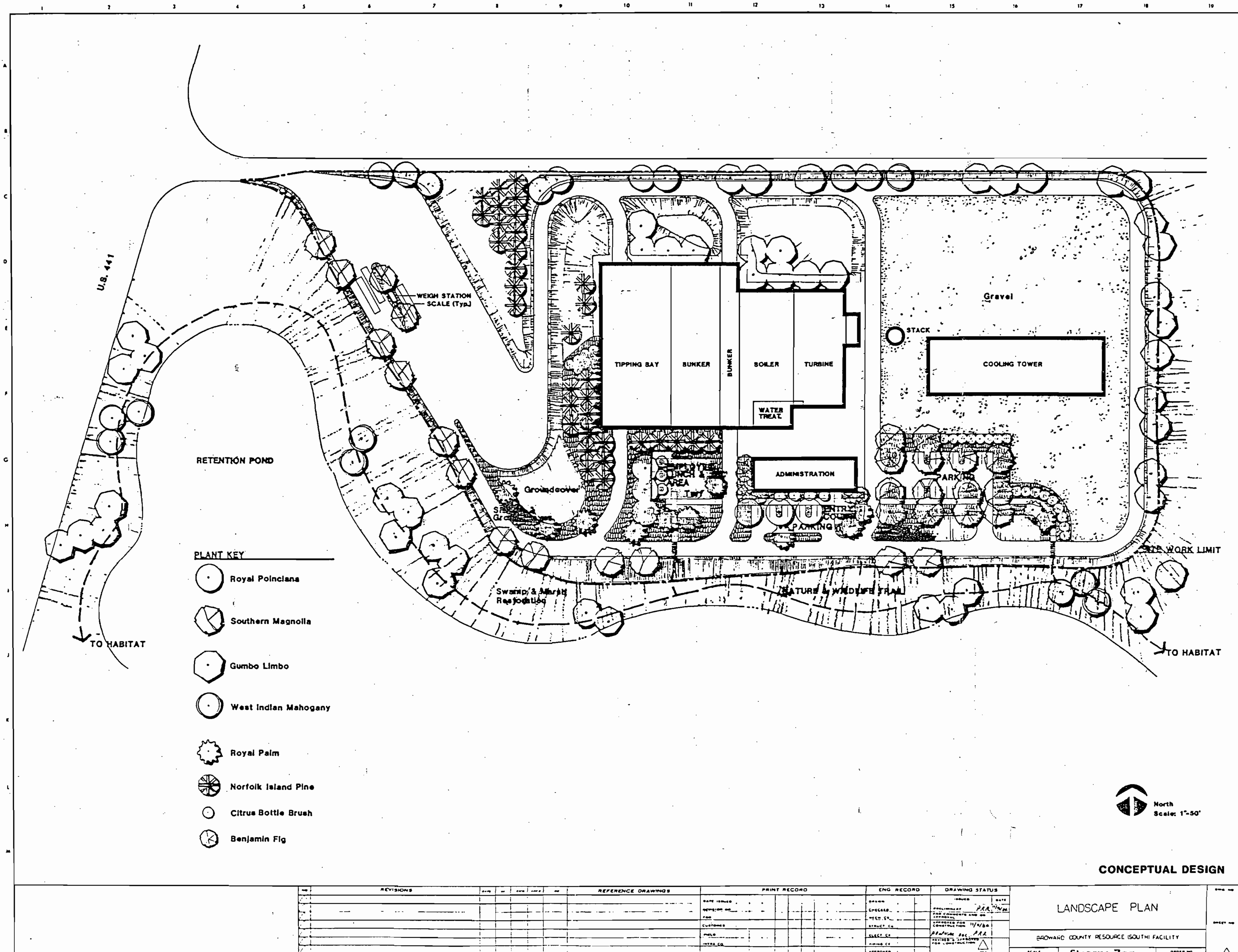
The facility structure itself will be aesthetically pleasing to the surrounding environment utilizing landscaping to enhance land use. Figure 7.1.5 presents the proposed landscape plan for the site. Ingress and egress roads will be sculptured to provide a panoramic view of the facility and accompanying structures.

Project Environmental Information and Impact Assessment Reports

Information on the environment and ecology at the South Broward County Resource Recovery Project site is contained in several reports.

Section 5 - 182 (i) of the Broward County Land Development Code (Ordinance 81-16) requires the Broward County Office of Planning to prepare an environmental impact report on environmentally sensitive lands. Since the Project partially encompasses land designated by the County as a Local Area of Particular Concern and, a proposed urban wilderness area an environmental impact report was prepared for the Project in January 1984 as a part of the rezoning process.

FIGURE 7.1.5


U.S. 441
WEIGH STATION
SCALE (Typ.)
RETENTION POND
Groundcover
TIPPING BAY
BUNKER
BUNKER
BOILER
TURBINE
WATER TREAT.
ADMINISTRATION
STACK
Gravel
COOLING TOWER
PARKING
SITE WORK LIMIT
Swamp & Marsh Restoration
NATURE & WILDLIFE TRAIL
TO HABITAT
TO HABITAT
PLANT KEY
Royal Poinciana
Southern Magnolia
Gumbo Limbo
West Indian Mahogany
Royal Palm
Norfolk Island Pine
Citrus Bottle Brush
Benjamin Fig
North
Scale: 1"=50'
CONCEPTUAL DESIGN
REVISIONS
REFERENCE DRAWINGS
PRINT RECORD
ENG RECORD
DRAWING STATUS
LANDSCAPE PLAN
BROWARD COUNTY RESOURCE (SOUTH) FACILITY
Stearns-Roger

To assist the Office of Planning in evaluating the impact of the Project on the site two other reports were prepared:

- o Land Use and Environmental Overview of the Route 441 Site - Broward County Resource Recovery, February, 1983, Data and Information for the Route 441 Site -- Broward County Resource Recovery -- Summary Report and Appendices A and B, July 1983.

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. Appendix 10.12, "Summary Update of Research Projects with Incinerator Bottom Ash Residue" illustrates the environmental acceptability of typical ash residue from mass-burn facilities.

Hydrogeological Field Investigation Program

A hydrogeological field investigation program has been prepared and approved for the Project 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:

- o Installation of soil borings to assess shallow subsurface geologic and hydrogeologic conditions and depths to ground water.

- o Installation of monitoring well clusters to provide permanent ground water quality sampling points.

- o Inventory of active wells within one mile of the sites.
- o Water level measurements to assess ground water flow conditions.
- o Sampling of monitoring wells to determine water quality conditions prior to landfilling.

The principal study outputs are as follows:

- o Definition of shallow subsurface geologic conditions.
- o Definition of depth to ground water, seasonal fluctuations, and thickness of unsaturated zone.
- o Assessment of horizontal and vertical ground water flow conditions.
- o Definition of pre-landfilling water quality conditions.
- o Assessment (from existing reports) of regional ground water flow and quality conditions.

(For a more detailed discussion of this program, see Section 2.3).

<u>Management Plan for Ann Kolb Park</u>

Prior to landfill development, an impact assessment must be prepared by the Broward County Resource Recovery Office to address the potential hydrological impacts of the development of the landfill in Ann Kolb Park in accordance with Broward County Ordinance Nos. 84-6 and 84-7. Data and information utilized in this application will be used to conduct this assessment. In the event potentially significant impacts are identified, a management plan must be developed to offer recommendations and mitigative actions to insure the integrity of the Park.

Plant Species Survey

As a part of the development of the Mitigation Plan, a special plant species survey of the project site was conducted (see Appendix 10.1.4). The survey enabled a plan to be developed which would minimize the impact of the project to the more significant vegetation in the mitigation area. Landscaping will be done around existing. Large clumps of native trees such as those found the northeastern and southwestern end of the mitigation area will be preserved. As appropriate, these areas will be enhanced by removal of discarded construction materials, selective removal of exotic species (per Broward County Ordinance 33½, and planting of native species (See Appendix 10.7). A monitoring report must be submitted to semi-annually to the Office of Planning for a period of three years after planting, indicating the survival rates of the planted material.

7.1.6 Creation of a Source of Heated Discharge

The Project will not create a source of heated discharge.

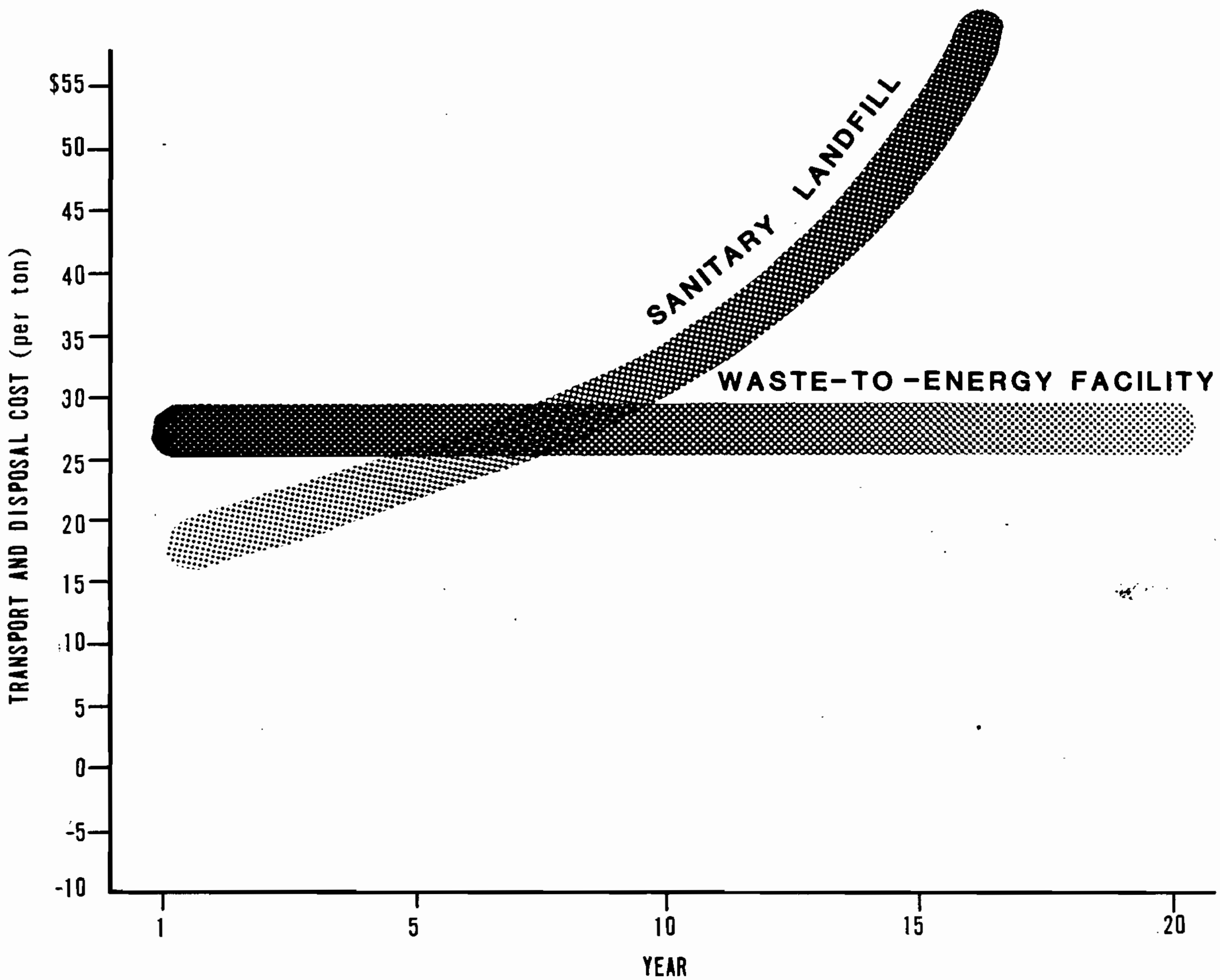
7.1.7 Visitor Accommodations

The Vendor for the South Broward County Resource Recovery Facility will provide for on-site public education programs for individuals and groups visiting the facility.

In addition, controlled visitor viewing locations, in various process areas of the facility, will be provided. These viewing spaces will not be directly exposed to operating equipment to assure the safety of the public. Elevators will be provided to facilitate visitor access and movement to all levels of the facility.

7.1.8 Economic Benefits

Figure 7.1.8.1 illustrates typical costs of solid waste disposal for both a sanitary landfill and waste-to-energy



* 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.

BROWARD COUNTY, FLORIDA

RESOURCE RECOVERY PROJECT
ESTIMATED SOLID
WASTE DISPOSAL COST

MALCOLM PIRNIE

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.

Resource recovery (waste-to-energy), although often more expensive than landfilling, usually becomes less expensive over the life of the project.

7.1.9 Energy Benefits

A significant benefit that will be realized once the facility becomes operational, is the generation of electric power. Approximately 328 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 328 million kwh estimate is based on a minimum guaranteed tonnage of 730,000 tons per year and a conservative electrical generation rate of 450 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, 730,000 barrels of crude oil per year or 14.6 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 14.6 million barrels of imported crude oil is approximately $287 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:

- Projected revenues will be included in the vendor's tip fee calculation thereby establishing a disposal cost that is consistent with long-term County projections.

- 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 is presently in the process of selecting a full-service vendor for the construction and 20 year operation (plus addition of 5 year County and 10 year contractor option periods) of the resource recovery facility and associated residue/unprocessable waste landfill. The full-service vendor will be the owner operator of the facility. The County will be prime customer or "anchor tenant" of the Project. Under this approach, the County expects the vendor 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 the vendor. 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. In turn, the County will: (i) guarantee on a put-or-pay basis specified quantities of processable waste; (ii) provide sites for the two resource recovery facilities and associated residue/unprocessable waste landfills; and (iii) give the vendor latitude in profitably operating the Project.

Based on proposals submitted by the two vendors competing to construct, own and operate the South Broward County Resource Recovery Project, 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: resource recovery facility construction, landfill construction, other related development costs, and site acquisition costs. The total costs are reduced by a factor equaling the vendor's contribution (equity) to the project. Competing vendors will be required to take a minimum 20 percent equity position on the total construction costs for the resource recovery facility and adjacent landfill. The County estimates that the total cost to purchase the site and make it available for resource recovery and landfill construction will be approximately $32,810,000. Thus to purchase and develop the site for construction the County will invest approximately $132,000 per acre. The County zoning classification for this site is Planned Unit Development for Special Complexes which is compatible with the construction of the proposed resource recovery facility and landfill.

To service the debt over the twenty year life of the project, including the cost of annual principal and interest, capitalized interest and debt service reserve fund, an assumed debt service factor of .175 has been used by the vendors. Utilizing the preceding assumptions together with the cost proposals submitted by the potential vendors, 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 negotiation with the selected vendor, however, they represent the best available estimates at the present time:

TABLE 7.2.1

CAPITAL COST

Cost Component	Range ($ in million)
Resource Recovery Facility Construction	175-220
Landfill Construction	12-15
Contractor's Contribution	(45)-(60)
Total Construction	142-175
Other Development (fixed)	4
Site Acquisition (fixed)	$32.8
Contingency Fund	7-9
Total Project	187-220
Annual Debt Service	35-40

In addition to the preceding capital costs, estimates have been made for the operations and maintenance costs of both the resource recovery facility and attendant unprocessable ash residue landfill 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 establishes 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 $22. 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 $29. Therefore, the cost differential between the resource recovery

TABLE 7.2.2

ANNUAL OPERATING COSTS AND REVENUES
(including interest income)

Cost Component	Range ($ in million)
Annual Debt Service	30-40
Operations and Maintenance of Resource Recovery Facility and Landfill	8-10
Total Annual Cost	40-50
Revenues	
Electrical Power Sales	14-18
Interest Income	3-5
Non-County Tipping Fee	1-2
Proposers Adjustment	1-5
Net Tipping Fee	25-35

facility compared to existing landfilling is approximately $7 per ton. As previously discussed this cost differential is expected to decrease as landfill costs increase. No additional cost to dispose of garbage in the initial year of resource recovery operation is therefore, expected.

Given the expectation of no additional cost or marginal 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 $7 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.

7.2.1 Temporary External Costs

Temporary external costs and benefits have been previously discussed in this section. 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	Minor
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	relocation of businesses only; no residential relocation involved; businesses (2) receiving compensation and relocation assistance

7.2.2 Long-Term External Costs

Long-term external costs and benefits have been previously discussed throughout this report. Specifically, the extensive mitigation plan (Appendix 10.7) was developed to offset any proejcted long-term external costs.

SECTION 8

SITE AND DESIGN ALTERNATIVES

8.1 Alternative Sites

To identify the most appropriate site for development of the South Broward County Resource Recovery Project and associated Ash Residue/ Unprocessable Landfill, 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:

- general location
- jurisdiction (unincorporated vs. incorporated areas)
- size
- existing zoning
- land use plan designation
- 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.

- 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.

This recommendation was also based upon a consideration of potential environmental impacts. With the proposed mitigation, use of the Route 441 site for resource recovery facility development was found to be compatible with existing and proposed development in this area. The other sites under consideration involved more significant impacts on adjacent residential areas or sensitive habitats. In addition, considerations of ambient air and water quality indicated that use of the Route 441 site for a resource recovery facility would be acceptable based upon the contemplated facility design criteria.

In early 1982, more detailed investigations were performed on the Route 441 site. These investigations were summarized in a Malcolm Pirnie letter report dated April 22, 1982. The results indicated that the proposed designation of environmentally sensitive urban wilderness areas in the vicinity of the Route 441 site would not be encroached upon by the proposed resource recovery facility development, and that the site was not within the corporate limits of Hacienda Village, a formerly neighboring municipality.

To verify the results of these initial studies, 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 locations. These sites were then evaluated based upon the following criteria:

- <u>Developed Area</u>: 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.

- <u>Location</u>: 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.

- <u>Size</u>: 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.

- <u>Development of Regional Impact</u>: Active and approved D.R.I.s were excluded from consideration because it was assumed that acquisition costs would be prohibitive.

- <u>Waterbodies</u>: 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:

- <u>Surrounding Existing Land Use</u>: The type of land use and its density were considered for compatibility and possible neighborhood opposition.

- <u>Surrounding Proposed Land Use</u>: 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 Route 441 site. This site was eventually selected for development of the North Broward County Resource Recovery Project.

The Broward County Commission on October 12, 1982, decided not to rely on landfill as a primary long-term disposal solution, but required a reevaluation of the following three top ranked southern sites:

Malcolm Pirnie evaluated the above sites in a report titled Site Evaluation Solid Waste Management Program, Southern Full Service Resource Recovery Facility on the basis of the following criteria:

- o Adequacy of the site to contain the southern resource recovery facility and an associated residue/ unprocessable waste landfill for the duration of the 20 year planning period.
- o A comparative estimate of site acquisition costs and preparation costs required to develop the site to 100 year flood elevations.
- o The site's proximity to energy markets and the technical feasibility of electrical interconnection at each site.
- o A comparative estimate of waste transport costs to each of the sites.
- o The impact at each site of the additional truck traffic associated with the proposed development.
- o Compatibility with the existing land use on and adjacent to each site.
- o Potential air and water quality impacts of the proposed development at each site.
- o An assessment of the number of regulatory permits/ approvals required at each site and the probability of obtaining such permits/approvals.

Table 8.1.1 summarizes the ranking of these sites. As illustrated, the Route 441 site was top ranked and recommended for development of the southern resource recovery facility and associated residue/unprocessable waste landfill. This recommendation was based upon the advantages inherent in its centralized location (potential waste transport savings of $100 million), the industrial nature of the site and surrounding area the availability of electrical interconnection with the adjacent Florida Power and Light Company generating station, and the adequacy of the site access roads.

Subsequent developments concerning the second ranked Davie site indicated that as a result of legal complications, the site was unacceptable for development as a resource recovery facility. These legal complications involve the uncertainty of the jurisdictional location of the Davie site. The Town of Davie, in opposition to the potential siting of the resource recovery project, alleged that the site had been annexed within the Town of Davie boundaries. Development at this site would therefore require the rezoning approval of the Town of Davie. The County concluded that the time required to complete the legal process would delay the project beyond the exhaustion of the County's current waste disposal capabilities. A legal opinion provided by the County Office of General Counsel concerning this situation is attached as Appendix 10.2. The third site, Broward Correctional Institute site, has been selected as a contingency landfill site.

8.2 Proposed Site Design Alternatives

As a full service vendor has not been chosen for the proposed project, site design alternatives are dependent upon requirements presented in the Request for Proposals (RFP) and design alternatives presented in the vendor proposals. Two vendors, Signal RESCO and American Ref-Fuel, have submitted proposals for the southern site. Presented below is a description of how each vendor proposes to provide the following facility systems while conforming to the RFP.

8.2.1 Cooling System

The cooling method utilized at the facility will be air cooling (air cooled condenser).

TABLE 8.1.1

RANKING OF SOUTHERN SITES

	Route 441	Davie	BCI
Overall Ranking	1	2	3
Available Acreage	295	380	630
Site Adequacy	Adequate	More than Adequate	More than Adequate
Estimated Annual Site Acquisition and Preparation Costs ($1000)	2,150	800	970
Annual Waste Transport Costs ($1000)	2,340	4,590	6,310
Project Traffic Impact ($1000)	60	30	30
Potential Environmental Impacts*			
Air Quality	1	1	1
Water and Soil Resources	1	1	3
Vegetation and Wildlife Habitat	1	1	1
Adjacent Land Use	2	2	2
Regulatory Permits			
Number Required	15	12	14
Approval Probability	Good	Poor	Moderate

*These ratings are based upon the assumption that the proposed mitigating measures for development of the southern resource recovery facility and residue/unprocessable waste landfill are implemented. Ratings range from 1 to 3, with 1 indicating the least and 3 indicating the most potential for negative impact.

Signal RESCO, in addition to providing an air cooled condenser to condense turbine exhaust steam, is also proposing to utilize a small package evaporative cooling tower to provide cooling for miscellaneous streams such as air compressors, sample coolers, etc. Additional water losses due to evaporation and blowdown will amount to approximately 25 gallons per minute.

8.2.2 Biological Fouling Control

If a small package evaporative cooling tower is used to supplement the air cooled condenser, then cooling tower biocides will have to be added at the cooling tower in the following appropriate quantities:

Inhibitor	2,600 lbs/year
Dispersant	1,300 lbs/year

8.2.3 Intake System

All intake water will be provided by County water supply; no other intake system is proposed.

8.2.4 Discharge System

All wastewater generated at the facility will be disposed of at the Hollywood Wastewater Treatment Plant. No other discharge system is proposed.

8.2.5 Chemical Waste Treatment

As described in Section 3.5, Plant Water Use, plant chemical waste treatment will be limited to pH neutralization of waste process water. The wastewater will be of acceptable quality to be disposed of at the Hollywood Wastewater Treatment Plant. As no other disposal method is proposed, other methods of chemical waste treatment have not been developed.

8.2.6 Sanitary Waste System

All sanitary wastewaters will be discharged to sanitary sewers for ultimate disposal at the Hollywood 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 input from 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 individuals, their respective association to the project, the date of contact, and the subject matter discussed. Table 9.2 is a list of additional individuals who have provided information throughout the development of this project.

TABLE 9.1

COORDINATION DURING LAND USE PLAN AMENDMENT
REZONING AND PREPARATION OF POWER PLANT SITE CERTIFICATION APPLICATION

Federal

Agency	Contact	Date	Subject
Department of Army (Jacksonville District)			
Corps of Engineers Regulatory Division, Permits Branch	Raymond Vachon Deputy Commander	July 13, 1984	Letter: re Permit application 83B-3304 and 83B-3305
		July 19, 1984	Letter: re Permit applications 83B-3304 and 83B-3305
	Col. Alfred Deveraux, Jr. District Engineer	July 11, 1984	Letter: re Modification request of Army permit 82R-1590
		August 4, 1983	Letter: re Application for activities in waters of the State of Florida Southern Broward Resource Recovery Facility
	Michael Slayton Chief, Regulatory Section	June 21, 1984	Letter: re Section 10 of of Rivers and Harbor's Act
	John Adams Chief, Regulatory Division	March 28, 1984	Letter: re Applications 83B-3304 and 83B-3305
		Nov. 9, 1983	Letter: re The Davie Site for potential location of Southern Broward Resource Recovery Facility
		Nov. 1, 1983	Letter: re Broward County Resource Recovery Project
		October 5, 1983	Letter: re Broward County Resource Recovery Facility
	Bertil Heimer Chief, Permits Branch	Feb. 16, 1984	Letter: re Placing fill in wetlands area

TABLE 9.1 (continued)

COORDINATION DURING LAND USE PLAN AMENDMENT
REZONING AND PREPARATION OF POWER PLANT SITE CERTIFICATION APPLICATION

Federal (continued)

Agency	Contact	Date	Subject
Corps of Engineers Regulatory Division, Permits Branch	Bertil Heimer (cont'd)	Nov. 8, 1983	Dredge and Fill Permit Application for Southern Broward
Environmental Protection Agency Region IV	Charles R. Jeter Regional Administrator	March 26, 1984	Letter: re: Broward County Southern Resource Recovery Landfill
Department of Interior			
Fish and Wildlife Service	Joseph Carroll, Jr. Field Supervisor	Nov. 23, 1984	Letter: re Manatee & Crocodile
	David Wesley Field Supervisor Endangered Species Field Station	Sept. 21, 1984	Letter: re Biological Assessment for Section 7 of the Endangered Species Act of 1973
House of Representatives	Daniel Mica Congressman	March 12, 1984	Letter: re Permit Application with EPA and Army Corp of Engineers
Department of Transportation			
Federal Aviation Administration	James Sheppard Manager	Feb. 6, 1984	Letter: re FAA Forms 7460-1 dated 12-5-83 Resource Recovery Projects
		December 8, 1983	Letter: re Notice of Proposed Construction
	Steve Nelson Airport Planning and Specialist	January 6, 1983	Letter: re Future site of resource recovery plant in Southern Broward
		April 5, 1983	Telephone Call: re FAA approval of Route 441 site

TABLE 9.1 (continued)

COORDINATION DURING LAND USE PLAN AMENDMENT
REZONING AND PREPARATION OF POWER PLANT SITE CERTIFICATION APPLICATION

State

Agency	Contact	Date	Subject
Federal Aviation Administration	Carl Stokoe Airspace Specialist	June 24, 1984	Letter: re Proposed resource recovery facility in Broward County
Florida Department of Environmental Regulation			
Solid Waste Permitting	John Guidry Supervisor Solid Waste Permitting, Chairman Technical Advisory Committee Injection Well Program	Jan. 24, 1985	Letter: re Application No. SC06-86059 and Application SC06-86060
		August 23, 1984	Memorandum: re TAC concept approval meeting to be scheduled in early Sept. 1984 on the two injection well projects associated with the Broward County Resource Recovery Program
		June 8, 1984	Letter: re William Grassi's Letter
		May 11, 1984	Letter: re Pre-application to construct a future Class 5 injection well system for the Southern Broward Resource Recovery Facility
		April 20, 1984	Letter of Transmittal: Application fees for following DER Solid Waste facility permits
		March 14, 1984	Letter: re Cell Number 14 Construction Permit Application, Broward County Sanitary Landfill

TABLE 9.1 (continued)

COORDINATION DURING LAND USE PLAN AMENDMENT
REZONING AND PREPARATION OF POWER PLANT SITE CERTIFICATION APPLICATION

State (continued)

Agency	Contact	Date	Subject
Solid Waste Permitting	John Guidry (cont'd)	Dec. 22, 1984	Letter: re Broward County Resource Recovery Project Solid Waste Management Facility Applications
		Nov. 16, 1983	Letter: re Draft copies of proposed construction
		Oct. 23, 1983	Resource Recovery Program for Broward County
Standard Permitting Section	Beverly Birkitt Environmental Supervisor	Sept. 24, 1984	Letter: re Broward County Resource Recovery Facility & Unprocessable waste landfills. File Nos. 060781739 & 060781749
		Sept. 14, 1984	Letter: re Notice of proposed Agency Action and Intent to issue
		Aug. 31, 1984	Letter: re Notice of final agency action
	Dan Garlick Environmental Specialist	July 19, 1984	Letter: re File Nos. 060781739 & 060781749
		July 9, 1984	Letter and Memorandum: re DER Dredge and Fill Permit for the Route 441 Site
		June 14, 1984	Letter: re Response to your completeness summary
		June 28, 1984	Letter: re Application File numbers 060781739, 060781749, and 060746599

TABLE 9.1 (continued)

COORDINATION DURING LAND USE PLAN AMENDMENT
REZONING AND PREPARATION OF POWER PLANT SITE CERTIFICATION APPLICATION

State (continued)

Agency	Contact	Date	Subject
Standard Permitting Section	Dan Garlick (cont'd)	April 23, 1984	Letter: re Amendment to be response to the completeness summary. File Nos. 060781749 & 060781739
		May 3, 1984	Letter: re Application File No. 060781739 Southern Resource Recovery Facility
		Dec. 15, 1983	Letter: re Southern Resource Recovery Facility next to the New River in Broward County
		Dec. 8, 1983	Letter: re Application File Number 06781749
		Oct. 7, 1983	Letter: re Preliminary Review - Drafts of Joint Applications for activities in the waters of the State of Florida
	George Baragona	May 14, 1984	Letter: re Southern Broward Residue/Unprocessable Waste Landfill Permit Application File Number 06078749
	Jeremy Craft	Nov. 16, 1983	Letter: re Amendment to the Dredge and Fill Permit Application for Broward County
		Nov. 4, 1983	Letter: re Dredge and Fill Permit Application for Southern Broward Resource Recovery Facility

TABLE 9.1 (continued)

COORDINATION DURING LAND USE PLAN AMENDMENT
REZONING AND PREPARATION OF POWER PLANT SITE CERTIFICATION APPLICATION

State (continued)

Agency	Contact	Date	Subject
Standard Permitting Section	Jeremy Craft (cont'd)	November 1983	Letter: re Dredge and Fill Permit Application for Southern Broward Residue/Unprocessable Waste Landfill
Florida Department of Natural Resources			
	James MacFarland Director of Statelands	Jan. 16, 1984	Letter: re File Number 06-78173-9E Applicant: Broward County; also File Number 06-78174-9E Applicant: Southern Broward Residue/Unprocessable Waste Landfill
Florida Department of Land & Water Management			
	Paul Darst	May 19, 1983	Telephone Call: re The forwarding of FP&L 10 Year Site Plans
Florida Department of Veteran and Community Affairs			
Division of Local Resource Management, Bureau of Land and Water Management	Blaine Oliver Associate Planner	Nov. 10, 1983	Letter: re Blid-1184-003 Broward County Resource Recovery Project
		Aug. 23, 1983	Letter: re Blid-1184-003 Broward County Resource Recovery Project

TABLE 9.1 (continued)

COORDINATION DURING LAND USE PLAN AMENDMENT
REZONING AND PREPARATION OF POWER PLANT SITE CERTIFICATION APPLICATION

State (continued)

Agency	Contact	Date	Subject
Division of Local Resource Management, Bureau of Land and Water Management	Blaine Oliver (cont'd)	July 27, 1983	Letter: re Application for activities in waters of the State of Florida Southern Broward Resource Recovery Facility
Florida Public Service Commission	Joseph Cresse	July 21, 1983	Letter: re Broward County's proposed resource recovery program
Intergovernmental Affairs	Eugene Suter Director	March 20, 1983	Memorandum: Proposed Legislation regarding Utility Funding for Resource Recovery Facilities

Regional

Agency	Contact	Date	Subject
South Florida Water Management District			
Resource Control Department	William Helferich Water Management Engineer	Jan. 23, 1984	Letter: re Application 11293-D Broward County Southern Resource Recovery Facility
		Jan. 24, 1984	Letter: re Application No. 11153-A, Application No. 11293-B, and Application No. 11293-D
		June 19, 1984	Letter: re Application No. 11153-A, Application No. 11293-B, Application No. 11293-D asking for a 60 day extension
		April 13, 1984	Letter: re Application No. 11153-A, Application No. 11293-B, Application No. 11293-D withdraw for 30 days

TABLE 9.1 (continued)

COORDINATION DURING LAND USE PLAN AMENDMENT
REZONING AND PREPARATION OF POWER PLANT SITE CERTIFICATION APPLICATION

Regional (continued)

Agency	Contact	Date	Subject
Resource Control Department	William Helferich (cont;d)	June 13, 1984	Letter: re about Applications 11293-D and 12193-B are on hold
		Feb. 6, 1984	Memorandum: re Application 11293-D and 12193-B
		Dec. 28, 1983	Letter: re Application No. 11293-D Broward County Southern Resource Recovery Facility
	Charles Pemble Director Water Management Division	June 25, 1984	Letter: re File No. 060746599, Broward County File No. 060781739 File No. 060781749 Broward County
		Aug. 3, 1984	Letter: re File Nos. 060781739 & 060781749
	Leslie Wedderburn Deputy Director	Feb. 7, 1984	Letter: re Application No. 11293-D and Application No. 12193-B
	Richard Rogers Director	Dec. 15, 1983	Letter: re Surface Water Management Permit Application for Southern Broward
		Nov. 23, 1983	Letter: Containing surface water management permit application for southern Broward resource Recovery Facility
South Florida Water Management District	John Malloy	Feb. 22, 1983	Letter: re Broward County Solid Waste Facility Siting

TABLE 9.1 (continued)

COORDINATION DURING LAND USE PLAN AMENDMENT
REZONING AND PREPARATION OF POWER PLANT SITE CERTIFICATION APPLICATION

Regional (continued)

Agency	Contact	Date	Subject
South Florida Water Management District	Jeanne Hall	Feb. 8, 1983	Letter: re Broward County Resource Recovery Program
South Florida Planning Counsel	Rod Arroyo	Jan. 12, 1984	Letter: re Broward County Resource Recovery Project
		County	
Economic Development Council	Steve Jernigan Executive Director	May 13, 1983	Telephone Call: re Presentation to his council
Public Works, Broward County	Dewey L. Bryant Director	May 11, 1983	Letter: re Discussion of Vendors
		April 18, 1983	Letter: re Reference Letter
Office of Planning	Diane Moore Environmental Coordinator	Nov. 16, 1983	Letter: re Request for additional information on the southern resource recovery landfill project (Route 441 Site)
		Nov. 17, 1983	Letter: re Request No. 2 for additional information on the Southern Resource Recovery Landfill Project at Route 441
		Dec. 15, 1983	Letter: re Water Management Work Permit
Water Management Division, Broward County	Roy Reynolds P.E.	Dec. 15, 1983	Letter: re Water Management Works Permit
Board of County Commissioners Pinellas County	W.W. Dasher Director, Public Works Operations	Oct. 20, 1983	Letter: re RCRA samples Pinellas County resource recovery facility

TABLE 9.1 (continued)

COORDINATION DURING LAND USE PLAN AMENDMENT
REZONING AND PREPARATION OF POWER PLANT SITE CERTIFICATION APPLICATION

County (continued)

Agency	Contact	Date	Subject
Board of County Commissioners Pinellas County	W.W. Dasher (cont'd)	Oct. 13, 1983	Letter: re Residue Ash Fill Leachate Quality
Environmental Quality Control Board, Broward County	William Stone Air Pollution Engineer	May 2, 1984	Letter: re Application for resource recovery in Southern Broward County
Broward County Environemental Quality Control Board	John Chase	Oct. 3, 1984	Memorandum: re Dredge & Fill Licenses
	Gary Carlson Chief, Air and Noise Pollution Section	April 4, 1984	Letter: re Broward County Resource Recovery Project Draft Noise Permit Application
Broward County League of Cities	Walter Falck Executive Director	Aug. 15, 1984	Resolution of the Broward County League of Cities authorizing and directing the develop-ment for the cities of Broward County
Broward County Resource Recovery Office	Carlton Miller Resource Recovery Coordination	Jan. 26, 1983	Letter: re Broward County Resource Recovery Plan
Broward County Parks and Recreation Division	Jim Clark	June 20, 1984	Memo: re Conversation with Phyllis Korab
	Floyd T. Johnson	July 13, 1984	Re: Waiver of 90 day time limit for Application SC06-86059 and SC06-96060
		Aug. 2, 1984	Letter: re Submitting additional information for the mitigation area

MALCOLM PIRNIE

TABLE 9.1 (continued)

COORDINATION DURING LAND USE PLAN AMENDMENT
REZONING AND PREPARATION OF POWER PLANT SITE CERTIFICATION APPLICATION

Local (continued)

Agency	Contact	Date	Subject
City of Fort Lauderdale	Alan Roberts	April 1, 1983	Letter: re Broward County Full Service Resource Recovery Project
City of Boca Raton, Florida Department of Sanitation	Michael Strasser	Feb. 15, 1984	Telephone Call: re Palm Beach County solid waste being disposed in Broward County
City of Miramar	Frank Branca Mayor	July 8, 1983	Letter: re Discussion of preliminary proposal for resource recovery project
City of Tampa	Joseph D. Nardoch	Apr. 16, 1984	Letter: re Tour of the McKay Bay Refuse-to-Energy Facility

TABLE 9.2

ADDITIONAL PARTIES CONTACTED

County

Agency	Federal	Title
Department of the Army (Jacksonville District)		
Corps of Engineer Miami Beach Area Office	Charles Schnepel	Inspector (Permits)

State

Agency	Federal	Title
Florida Department of Environmental Regulation		
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
Bureau of Air Quality Management	Larry George	Environmental Administrator
Bureau of Air Quality Management	Clair Fancy	P.E.
Bureau of Air Quality Management	Edward Svec	Engineer
Bureau of Air Quality Management	Gary Early	Attorney (Tallahassee)
Bureau of Air Quality Management	Roy Duke	Regional Director
Bureau of Air Quality Management	Steve Fox	Permit Administrator (Tallahassee)
Bureau of Air Quality Management	Steven G. Conn	Permitting
Public Service Commission	Bonnie Davis Robert Trapp	General Counsel Engineer

TABLE 9.2 (continued)

ADDITIONAL PARTIES CONTACTED

County

Agency	Federal	Title
Broward County:		
Environmental Quality Control Board, Broward County	Vic Howard	Pollution Control Officer
	James E. Elias	Biologist Manager, non Solid Waste Section, Broward County Utilities Division
	Fran Henderson	Water Quality Investigator
Broward County Aviation Division	James E. Benedict	P.E.
	Richard Mooney	Project Director of Airport Expansion
Office of Planning Broward County	Roy Groves	Director, Plan Implementation
	Kelly Carpenter, AICP	Formerly Director, Plans & Implementation Division
	Al Shamoun	Associate Planner
	Arla Bernstein	Associate Planner
	Don Kowell	Director, Office of Planning
Finance & Administrative Services Dept.	Thomas Elliott	Formerly Assistant Finance 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

TABLE 9.2 (continued)

ADDITIONAL PARTIES CONTACTED

County

Agency	Federal	Title
Broward County: (cont'd)		
Aviation Division	James E. Benedict	P.E.
	Richard Niedenthal	Asst. Director Aviation Division
Project 80's Airport Expansion	Richard Mooney	P.E. Executive Director
Property Division	Frank Frey, Jr.	Director
General Counsel Office	Susan F. Delegal	County Counsel
	Annette Star Lustgarten	Assistance General Counsel
Finance and Administrative Services Department	Foster Muzca	Director
Offices of Budget and Mgmt.	John Canada	Director
Florida Department of Transportation:	William K. Fowler	District Engineer
	Timothy O'Brien	Deputy, Formerly District Right of Way Administrator
	Jerry Sasser	I-595 Utility Engineer
Florida Power & Light Company:	Douglas P. Macke	Administrator of Governmental Services
	Duane Bateman	Right-of-Way Representative
	Robert H. Stevens	Distribution Engineering Dept.
Municipalities:		
Dania	Richard Marant	Formerly City Manager
Davie	Irv Rosenbaum	Town Manager
	Bud Jenkins	Mayor

TABLE 9.2 (continued)

ADDITIONAL PARTIES CONTACTED

County

Agency	Federal	Title
Municipalities: (cont'd)		
Hollywood	James Chandler	City Manager
	Taylor P. Calhoun	Utilities Division Director
Ft. Lauderdale	Robert Cox	Commissioner
	Alan Roberts	Utilities Division Director
Miramar	Milan Knor	City Engineer
Broward League of Cities:	Walter Falck	Executive Director
South Florida Regional Planning Council	M. Barry Peterson	Executive Director
National Marine Fisheries Service	Gary Nelson	Fishery Biologist
Florida House of Representatives	Anne MacKenzie	Representative, 95th District
Florida State Senate	Tom McPherson	Senator, 30th District
United State House of Representatives	E. Clay Shaw	Congressman, 15th District
	Larry Smith	Congressman, 16th District
United States Senate	Lawton Chiles	Senator
The Trust for Public Land	Joel Kuperberg	Vice President

SECTION 10

APPENDICES

Appendices 10.1 through 10.18 are included as part of this submittal in two separate volumes. Volume II contains Appendices 10.1 through 10.8. Volume III contains Appendices 10.9 through 10.18.

SECTION 11

REFERENCES

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